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KNOWLEDGE WORKERS AND THEIR RELATIONSHIPS WITH ORGANISATIONS

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## Thesis Summary

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The programme of research examines knowledge workers, their relationships with organisations, and perceptions of management practices through the development of a theoretical model and knowledge worker archetypes. Knowledge worker and non-knowledge worker archetypes were established through an analysis of the extant literature. After an exploratory study of knowledge workers in a small software development company the archetypes were refined to include occupational classification data and the findings from Study 1. The Knowledge Worker Characteristics Model (KWCM) was developed as a theoretical framework in order to analyse differences between the two archetypes within the IT sector. The KWCM comprises of the variables within the job characteristics model, creativity, goal orientation, identification and commitment. In Study 2, a global web based survey was conducted. There were insufficient non-knowledge worker responses and therefore a cluster analysis was conducted to interrogate the archetypes further. This demonstrated, unexpectedly, that there were marked differences within the knowledge worker archetypes suggesting the need to granulate the archetype further. The theoretical framework and the archetypes were revised (as programmers and web developers) and the research study was refocused to examine occupational differences within knowledge work. Findings from Study 2 identified that there were significant differences between the archetypes in relation to the KWCM. 19 semi-structured interviews were conducted in Study 3 in order to deepen the analysis using qualitative data and to examine perceptions of people management practices. The findings from both studies demonstrate that there were significant differences between the two groups but also that job challenge, problem solving, intrinsic reward and team identification were of importance to both groups of knowledge workers. This thesis presents an examination of knowledge workers' perceptions of work, organisations and people management practices in the granulation and differentiation of occupational archetypes.

## Dedication

For Ethan and Libby

## Acknowledgements

Many thanks to Ann Davis for her patience and guidance, to Joel Spolsky and Mark Slater for helping with the Knowledge Worker Survey. Thanks to all who participated in the research project.

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## Chapter 1 Introduction

### 1.1 Introduction

Over recent years it has become apparent that some fundamental aspects of work and organisations have undergone significant changes. Set against the backdrop of an increasingly knowledge based, post-industrial society these changes have been identified as being significant in how we understand work and workers and how these shifts may affect organisations and their attempts to manage them. As new societal contexts emerge so does vocabulary to describe and articulate new social artefacts. In this case the emerging terminology has been to describe workers in this emerging knowledge focused context as knowledge workers. Knowledge workers are considered by many commentators to be fundamentally different from traditional workers in the nature of their work, their attitudes to work and employing organisations and in their reactions to established management practices. In 1980 Hackman and Oldham asked the question 'Just how satisfactory are person-job relationships in contemporary organisations?' The opening chapter of Job Design (Hackman and Oldham, 1980) considers this question in relation to blue and white collar workers suggesting that increasing differences between these workers required a different approach to the design of the work in order to ensure that they were satisfied and motivated. It would seem that the knowledge work discussion has continued in a similar vein, referring to knowledge workers as 'gold collar' workers (Kelley, 1985). These gold collar workers can be seen to exhibit a number of similar characteristics to the white collar worker, such as that the work is interesting, they have enough autonomy to do the job and opportunities to 'develop special abilities' (Quinn, Staines and McCulloch, 1974 cited in Hackman and Oldham, 1980).

The first references to knowledge work were made by Peter Drucker (1963; 1969) in the 1960's, who suggested that there was a new breed of worker who would be fundamentally different to all who had gone before. He suggested that they would primarily work with knowledge as a commodity, which meant that they could not be easily managed as their work would be unseen. They were suggested to be highly mobile due the fact that they did not require capital intensive resources in order to generate value. This was also detailed in the work of Daniel Bell who postulated that the nature of work would change in accordance with changes in technology and related social processes alongside the development of the Knowledge Economy (Bell, 1974). Despite the prescience of Drucker this debate did not come to fruition until nearly thirty years after his original observations. Much of the literature relating to knowledge work and knowledge workers emerged in the mid 1990s

and early 2000's, where some theoretical developments were made and empirical work was undertaken to examine these workers. A full review of this literature is presented in Chapter 2.

Whilst observations relating to knowledge work were emerging there was also much discussion as to the nature of the knowledge economy and post-industrial society which considered the organising of work and how the nature of work itself may have changed. It is therefore important that this context is examined before presenting the research questions and objectives which arise from it. This chapter, having outlined the broad concept of knowledge work, goes on to discuss the context for the study concluding with an outline of the research and the corresponding chapters which make up the thesis.

## 1.2 The post-industrial context – work and organising work

### 1.2.1 The organisational perspective: changes in structures and ways of organising work

Examination of knowledge workers and their relationships with organisations has as its historical backdrop significant societal change which has provoked intense discussion as to evolving forms of work and what this may mean for the organisation of work. In order to contextualise this thesis issues of broader context, work and organising work arising in the literature are discussed.

The nature of the post-industrial context is one which has prompted commentators and researchers to consider how it differs from the industrial, modernist setting which preceded it, particularly regarding the impact that the shaping effect of extraneous forces has upon the monolith of bureaucratic organizing (Barley and Kunda, 2001). The General Schema of Social Change (Bell, 1974) identifies the geographic locations of pre-industrial, industrial and post-industrial societies (in the USA and Western European economies) and their predominant occupational forms. The occupational slope identifies semi-skilled workers and engineers as being exemplary occupations of the industrial category, which are replaced by professional and technical scientists in the post-industrial society. It is apparent therefore 40 years hence, that there are no IT related occupations mentioned and that the extent of the influence of information technology on social change (which has occurred perhaps due to the development of processing power as articulated by Moore's law) had not been predicted. However, the axial principle of the Schema moving to 'centrality of and codification of theoretical knowledge' in post-industrial society could be said to describe the over arching themes which are embodied in IT applications and usage. That is, the centrality of theoretical knowledge to the societal shift is what is significant here as this is what underpinned and sustained the post-industrial

transition. This shift from production focus to a knowledge focused society was considered by Bell (1974) to be characterised by problems relating to science and education related social policy, tensions between public and private sectors and the cohesiveness of the “new class” which was to emerge with a broader sociological reaction of resistance to bureaucratization and the Adversary Culture. Bell acknowledged that the concept of the post-industrial society was primarily ‘an ordering device’. However, it is one which allows theorists to historically to view the period of change alongside key factors which impact upon other societal artefacts such as work and organisational forms.

Barley and Kunda (2001) suggest that the degree of scholarly interest in work itself, in contrast to organisational structures/forms, diminished somewhat in the latter part of the 20<sup>th</sup> century when analyses of structure, strategy and operating conditions predominated due to the retention of a relatively stable view of bureaucratic organisational forms. As the ‘knowledge economy’ was developing in the United States and other Western economies were becoming increasingly post-industrial with the steady demise of blue collar work and the increase in white collar occupations, interest was piqued in new forms of organisation which were being co-created with this socio-economic transition. New conceptualisations and language emerged for articulating organisational forms including for example post-bureaucratic (Clegg, 1990) adhocracies (Toffler, 1970; Mintzberg, 1989); network organisations (Nohria and Eccles, 1992; Snow et al, 1992; Castells, 1996); flexible firms (Atkinson, 1984; Volberda, 1998); loosely coupled networks (Weick, 1979); metaphors of organisations (Morgan, 1997; Handy, 1993) and boundaryless organisations (Arthur and Rousseau, 1996). Barley and Kunda (2001) observed the alterations in the occupational landscape and the impacts upon the dynamics of work, particularly with regards to the decline in stable, full-time permanent employment and the rise of contingent work. The context of the information-intensive economy provoked discussion from Child and McGrath (2001) as to these new organisational forms. They recognised that the proliferation of new organisational forms was not accounted for by appropriate theory and therefore set out to examine alternative theoretical contributions in the ‘search for alternatives to conventional bureaucracy’ p1135. They take a popular approach of contrasting conventional and emerging perspectives or employing ‘conceptual inversion’ (Barley and Kunda, 2001) (much as the dyadic approach to knowledge work and traditional work is formulated and outlined in Ch 2) to three key organisational activities of goal setting, maintaining integrity and differentiating rights and duties. In contrast to the conventional (bureaucratic perspective) the emerging organisational form would be described as one which is decentralised in terms of goal-setting with distributed power, smaller units of teams and groups with leaders who provide guidance

and intervention with regards to conflict. The boundaries of the emergent organisation are viewed as being permeable and fuzzy with horizontal information flows and relational bases to interactions. There are similarly fuzzy roles and boundaries in the organisation with adaptation and impermanence being key descriptors of the emergent type. These descriptors outline the attributes that have been identified in network organisations, with self-organising teams, a relational focus and coordinated horizontal integration. It is suggested that this is achieved by having small, fluid integrated teams who are often comprised of the contingent workforce thereby displacing the key elements of the organisation to beyond its traditional boundaries (Child and McGrath, 2001). It would appear therefore that the nature of the work itself is integral to the manifestation of the organization of work. It is noted by Galunic and Eisenhardt (2002) in their study of 35 virtual teams within large corporate settings that they were both the produce of, and the producer of, complex social processes which affected how work was distributed. Rindova and Kotha (2002) also identify the 'continuous morphing' of organisations in their examinations of Yahoo and Excite, noting the emerging responsive strategies and structures which could be considered to be descriptive of new knowledge-based organisations. Whilst empirical work on organisational structures was undertaken in response to societal and technical changes there was also a rally cry to balance this interest in new ways of organising work with increased attention to the nature of work itself (Barley and Kunda, 2001).

### 1.22 Examining new ways of working

Barley and Kunda (2001) urged fellow researchers towards 'Bringing Work Back In' in an attempt to further understand the nature of work and its impact on organisations in the knowledge economy, calling for '...an updating of conceptions of work' (p77). They identified that stable employment was declining and that contingent work was increasing, with technology eliminating some types of work and creating others. This contingent workforce 'refers to the sense that the relationships on average are less secure and more contingent on short-term changes in employer demand than in regular employment' (Cappelli and Keller, 2013a, p875). However, it should be noted that stability and regularity can also be features of part time work and not solely associated with full-time permanent employment. Cappelli and Keller (2013a) suggest that it is necessary to move away from 'petrified images of work' which were established due to the predominant focus in the second part of the 20<sup>th</sup> century upon organisation studies rather than work studies. They identify petrification as being evident in the language of work, ideal typical occupations and formal classifications of work. It is interesting to note, specifically in relation to this thesis, that they call for a renewal of understanding as to what it is to hold a job and to engage in work and the contrast that there may be in engaging in a series of tasks that define the job in relation to organisational requirements. They consider that

the use of broad taxonomies such as, blue and white collar worker may no longer adequately describe differences between work. They however reinforce the usefulness of ideal types as follows:

“By reducing the diversity of work to a few modal images, ideal–typical occupations help us comprehend the complexity of the division of labor and assign status to individuals. They help parents shape their children’s aspirations....it is not clear how we could think in general terms about worlds of work without such anchors”

(Barley and Kunda, 2001, p83)

The extensive variety of jobs and the ‘constellation of attributes that captures a family resemblance’ (p83) means that there is now considerable overlap between many traditional ideal types particularly given the continual state of change within organisations and roles. This supports a re-examination of the nature of ideal-types within contemporary, post-industrial occupations in line with the thesis research objectives, literature review and studies reported in the forthcoming chapters.

Barley and Kunda (2001) suggested that the occupational classification systems which act as the framework for our conversations about work were outdated, requiring review in order to adequately reflect the post-industrial context. This has been addressed as, in the years since this observation was made, the O\*NET classification has been substantially and comprehensively reviewed to include new occupations and their associated features. The methodological approach used in Study 2 demonstrates the usefulness of updated classifications in developing knowledge of post-industrial work. It is apparent therefore that there is a need to understand new forms of work in order to complement the ongoing work on organisations by returning to view work and worker as the primary foci of study. Many authors and commentators took up this challenge in the form of observations and writings using the terminology of knowledge work(ers). As the unit of analysis moves towards work and the workers there are some identifiable differences in use of the knowledge work(er) terms which require clarification in order to develop work further. This literature is presented for discussion as a separate body of work in Chapter 2. In line with the methodology in this thesis Barley and Kunda (2001) emphasise the usefulness of interviews in understanding how individuals make sense of the work that they do and also by comparative design in examining distinctions within occupational families.

### 1.23 The changing nature of the employment contract

Perhaps one of the clearest, and therefore least provocative methods, of describing new forms of work and ways of organising work is to describe the nature of the employment contract. It is this approach that is taken by Cappelli and Keller (2013b) whereby they address the issue of lack of clarity

in classifying work in the new economy by creating a classification system. They suggest that extant organisational research fails to account for new, alternative types of employment as it is primarily located within the traditional group of full-time, employed workers. The authors identify that inadequate classifications of work impact upon understandings of work and organising for work. Identified inadequacies are those which use the dyadic approach of contrasting contingent work to full-time, regular employment with job security being a fundamental feature of this approach. A similar dyad is that of non-standard work versus standard, with the latter describing full-time, long term employment and the former encompassing all else. They note that dispersed geographic locations, home-working, etc are all features of organisational life but would not be considered to be standard throughout. Their concern is that unusual but interesting features of work are therefore studied and reified as the new and interesting norm of work. Externalised location of work was also cited as an example of alternative or novel work forms (Pfeffer and Baron, 1988 were early adopters of this approach). Cappelli and Keller (2013b) consider that length of tenure and location are insufficient and inadequate differentiators in describing the organisation or structuring of work. In order to establish an inclusive and clear classification system they employ distinctions in tier 1 of their taxonomy only in the nature of the employment relationship, taking an employment law perspective. The second tier of the taxonomy focuses upon control as the differentiator in the work organisation. The notion of control is considered to be a defining feature of the employment relationship (derived from both their literature review and experience). This distinctly relates to the organisations ability to exert full directive control where they are able to tell the employee what to do and how to do it (in work process, constraints relating to length of time, scoping of tasks etc) thus differentiating employment from contract work in these terms. As part of the employment classification the authors establish that this can be subdivided into direct employment and co-employment with the latter describing a tripartite relationship with the worker, organisation and agency sharing directive control. Cappelli and Keller (2013b) identify that this triadic relationship creates a significant complexity to the study of new types of work and organising of work (this is examined in further detail in Barley and Kunda's (2004) work below). The authors' use of 'directive control' as a method of identifying the employment type and the nature of the relationship formed by this brings clarity to the discussion. However it does not, nor does it claim to, deal with the unique labour market conditions of particular occupations which form part of the broader context and which arguably affect the strength and longevity of the relationship between the worker and the organisation. They suggest that this clarification of work arrangements aids in the further exploration of attitudes and behaviours in relation to different employment contexts.

This clarification is exemplified in Barley and Kunda's work (2004) specifically examining co-employment, direct and subcontracting work within the IT sector (differentiating these as new types of employment where there is gradation of directive control). The authors identified that there was little empirical research relating to contract workers who could be considered to be part of a 'contingent workforce' which had emerged within the post-industrial, post-bureaucratic setting viewing contracting as '...a manifestation of the groundswell of change that, by all accounts is shaking the foundations of work and employment in the US' (p285). This was particularly evident within the IT sector which was seen an unequivocal exemplar of this movement to non-traditional manifestations of work. Barley and kunda (2004) examined IT contractors, clients and staffing organisations in order to '...simply...understand how employment relations were changing at the dawn of the twenty-first century' (p8,9). Their ethnographic studies examined the three groups with 71 interviews with contractors, 3 staffing agency participation observations over a period of 3-6 months and interviews in organisations held with employees, contractors and managers in software development/programming teams. The data was collected at the height of the boom before the recent recession and they acknowledge that it is 'the fate of social science' (p30) that their research documents a particular period of history where the labour market was particularly tight and contracting was at its peak. Despite this limitation the research details a fascinating world of individual and organisational experiences lived within the knowledge economy. The findings from this research underline much of the discussion from the literature relating to characteristics of knowledge work and knowledge workers as discussed in Chapter 2. From the 'itinerant experts' point of view they were largely free to enjoy employment without the political constraints of 'regular employment' as they were able to sufficiently distance themselves from the politics, incompetences and inequities of organisational life. They noted that narratives typically contained the 'lament' whereby 'tension between an ideal of technical rationality and realities of organisational life had become a source of simmering discontent' (Barley and Kunda, 2004; p55). It was apparent from the data that contractors had a deep-seated sense of their own professional ideology of work which caused them to seek greater freedom to exercise technical judgement through autonomous working conditions, flexibility and treatment as influential technical decision makers (alongside the opportunity to make a greater amount of money – although this is questionable in fact given the amount of hours worked in sustaining a contracting income).

The authors recognise that there is immense danger in assuming that all client organisations speak with one voice as there have varying reasons for their employment of contractors. Despite this, one common thread to the authors' observations is that the clients primarily cited skill acquisition as a

key reason for acquiring skills, using the terms 'hired guns' or 'warm bodies', when the skills were required immediately but for a limited period of time. They were also seen to be 'gurus' when required to provide the knowledge, skills and experience for knowledge transfer into the core employee population. This allowed organisations to shift the burden of development and acquisition to employees and contractors with the latter providing knowledge to the former and the former being required to update skills in order to maintain their organisational status. The resultant looser connections between the organisation and individuals in terms of skill/knowledge development investment may contribute to the limited commitment which was identified by employees commenting on contractors attitudes. However, it could be suggested that the general nature of employment for contractors and the accompanying freedom to enjoy increased autonomy, responsibility and authority as a feature of their itinerant status, satisfied many of the requirements of the contractors whilst contributing to lessened commitment to the organisation. Barley and Kunda's study (2004) also identified that contractors did not see themselves as being human resources to be managed by the client organisations as they were responsible for themselves through the selection of their own contracting assignment which maximised intrinsic and extrinsic rewards (health insurance was a significant factor). The tenuousness of this relationship and the shift in balance of power towards the contractor gives an interesting insight into the nature of work in the post-industrial economy with greater power residing with the worker who has the knowledge which is required by the organisation. Barley and Kunda (2004) argue that their work supports the view that there are considerable differences in the nature of work and would also assert that the distribution of occupational knowledge is leading to occupational forms of organising whereby occupational structures support market dynamics, projects and complimentary teams rather than tasks and associated roles as the foci of organizing.

The ethnographic studies conducted by Barley and Kunda (2004) in this identifiably post-industrial, knowledge economy context demonstrate that there are fundamental shifts in how work is conducted, experienced and organised by individuals and organisations. Okhuysen et al (2013) recognise that the domain of work is vast, typically including activities that one might consider to not be work, for example volunteering, home making or open-source software work (OSSD) (although one might also suggest that OSSD is a new form of volunteering work). They assert that '...work is the content, but also the context in which individuals live act and interact with others' (2013; p492). It is from this point that we return to the notion that organising and the work activity are inextricably linked. Okhuysen et al (2013) recognise the significance of 're-calibrated power dynamics' within the knowledge economy generating new organisational forms, as previously discussed in Barley and Kunda's work (2004). They also suggest that recontextualisation of older theories of work may be

useful as the economy shifts again towards a new era of high value manufacturing in the post-industrialised economies. They note that the older theories of work were not deemed to be significant in the post-industrial context but had been somewhat abandoned in the belief that work and organisations had become so fundamentally different that there was little value in their application. Barley and Kunda (2001) however recognise that work and the characteristics of jobs remained relevant to furthering research in this area calling for new applications to be made in the post-industrial context.

#### 1.24 Organising for post-industrial work

Puranam et al (2014) acknowledged that the post-bureaucratic organisation has been inadequately studied and the assertion that organisations primarily took a network form should be queried due to a need for reframing discussions of organisational forms in order to develop contemporary understandings of *organising*. Organisations have commonly been viewed as multi-agent, bounded systems with clear system level goals towards which effort is directed and contribution made (Puranam et al, 2014). The authors assert that organising and organisations are not the same thing (Weick 1969, 1974 in Puranam et al, (2014) suggesting that a form of organising can be conceptualised as a problem solving process solution directed at four universal problems. The four problems addressed are task division and task allocation (division of labour), reward provision and information provision (integration of effort). If solutions for the four universal problems of organising are seen to exist then this would constitute the existence of an organisation. Task division is described here as the problem of mapping goals into sub-tasks which are then allocated to individuals/groups (e.g. formal role and recruitment into this role by an individual with authority). A link is made here to the definition of task in order to minimise interdependence and to clarify responsibility for outputs as per the job characteristics model whereby task is significant in the definition of the job and the resultant outcomes. The definition of the employment contract and delegation of the task by an authority figure here is seen as defining the boundary. Similarly provision of rewards, both implicit and explicit, to produce cooperation and provision of information to promote coordinated efforts with others are seen as being devised through authority within a traditional business setting. The authors contrasted six case study organisations with comparable goals as examples of old and new forms of organising within three comparable contexts. Of greatest interest to the work in this thesis is that of the Proprietary Closed Source Software Development (PCSSD) company and the Open Source Software Development (OSSD) company. It was found that there was considerable novelty in ways of organising work in relation to task allocation whereby contributors in the OSSD self-selected their preferred sub-tasks rather than an authority figure assigning the task to them. Tasks were also divided according to personal skills and motivation with

contributors seeking specialisms or the opportunity to develop breadth in seeking variety. Puranam et al (2014) suggested this would increase the likelihood of individuals contributing as opposed to free-riding (benefiting from others work and contributions to the OSS development project). They also examined a traditional encyclopaedia and Wikipedia and a single organisation called Oticon, which existed in two distinct organisational forms. The notion of contrasting old and new forms of organising where the goals of the organisations are the same leads the authors to suggest that configurational approaches are most useful for understanding variations within forms of organising as that is primarily how the problems of adaptation are solved. It could be suggested however that whilst the explicated goals of the organisation are similar at face value, for example to develop working software solutions, there may be overriding goals such as the hidden desire of the founders of the project to develop a guru-like role in the community or to develop products which can be sold or franchised for financial gain. These goals are not often articulated but could be argued to affect the nature of the organising that happens and ultimately make the comparisons made between organisations problematic. Perhaps the challenge is therefore to adequately mine for truth as to the organisational goals rather than assuming that they are similar because the product or service outcomes are similar. The call for greater depth and clarity in understandings of work and organising work within the knowledge economy (Puranam et al, 2014) and the literature of the last 15 years within this domain leads us to consider that understanding knowledge workers and their relationships with organisations is closely linked to commentary on new organisational forms, considerations of the nature of the employment relationship, classifications of work and the experiences of what work is to the worker performing the tasks. It is apparent that the construction of work and the interactions that workers have with those who are responsible for this construction have much to tell us about the nature of the knowledge economy from studying new forms of work (Barley and Kunda, 2001; Barley and Kunda, 2004). It is from this point that we take the terms knowledge work and knowledge worker as being articulations of this new conceptualisation of work in the knowledge economy answering the call by aforementioned authors to re-examine occupation, job and the nature of people management.

### 1.3 Research questions and objectives

It is clear therefore that there is an acknowledged need to examine work and workers within this new context which features different types of work configuration and ways of organising – commonly termed knowledge work. The call to return to examining work and workers as part of this understanding of the post-industrial context raises a number of research questions derived from the literature related to context, knowledge work and the knowledge economy.

The initial two questions arise from the aforementioned context and the abundance of different occupations, workers and organisational settings studied in relation to knowledge work(ers) as detailed in Chapter 2. The notion of querying the characteristics of knowledge work relates to the desire to contribute to Barley and Kunda's (2001) call to updating understandings and conceptions of work. Section 1.2 identifies the nature of how, for many, the employment contract has changed and generated a range of issues relating to how individuals perceive the work that they do and those that they do it for (such as levels of decision making, autonomy, (Barley and Kunda, 2004; Puranam et al, 2014) and 'recalibrated power dynamics' (Okhuysen et al, 2013, p495) which are raised in questions 3, 4 and 5. The last question emerges from the logic that shifting forms of work and organising of work should therefore require a review of the types of management strategies and practices used to reward, motivate, generate commitment and ultimately enhance performance in the workforce.

#### 1.31 Research Questions:

- 1) Who are knowledge workers and what is knowledge work?
- 2) What are the key characteristics of knowledge work?
- 3) What perceptions/attitudes do knowledge workers have of/exhibit towards their work and to their employing organisations?
- 4) How do these attitudes affect the way in which they relate to organisations?
- 5) What perceptions do knowledge workers have of their employing organisations and the practices they use to manage these workers?
- 6) What aspects of HR strategy formation and practice should organisations address in order to effectively manage knowledge workers?

The initial questions are addressed by an analysis of the knowledge work literature in order to establish who knowledge workers are and to establish the characteristics of their work. The remaining questions are addressed through the meeting of the following objectives in the programme of research presented in this thesis:

#### 1.32 Research Objectives

1. To examine knowledge workers attitudes to and perceptions of their work
2. To assess how knowledge workers relate to their employing organisations
3. To explore knowledge worker perceptions of people management practices and HR activities used by organisations in managing knowledge workers.

4. To make recommendations as to how organisations can most effectively develop HR strategies and people management strategies in order to effectively manage knowledge workers

These objectives will be met through a detailed analysis of the knowledge work literature in order to develop archetypes for examination using a theoretical framework based upon the job characteristics theory of Hackman and Oldham (1980). This research allows the Job Characteristics Model to be examined in a contemporary setting as similar questions are being asked 30 years later regarding the nature of work, person–job fit and the implications that this has for desired organisational and personal outcomes (Okhuysen 2014, Puranam et al 2014, Cappelli and Keller, 2013a). Issues relating to people management and HR activities are examined as an integrated part of the research process. The structure of the thesis and the programme of research will now be outlined.

#### 1.4 Thesis Structure

This programme of study emanates from the questions and research objectives detailed previously. Chapter 2 details the literature relating to knowledge work and knowledge workers, with reference to four specific threads of knowledge work, knowledge worker characteristics, knowledge work occupations and management of knowledge workers. The most appropriate context for the programme of research is determined from the literature to be the IT sector as workers in this sector are consistently determined to be representative of the knowledge economy, particularly as many of them work in knowledge intensive firms (KIFs) or professional service firms (PSFs). At the end of Chapter 2 the literature is used to develop the knowledge worker and non-knowledge worker archetypes which are used as the units of analysis for the subsequent studies designed to meet the research objectives. Initially the archetypal knowledge worker was determined to be best investigated as a software developer in line with the studies presented in Chapter 2, once again this is due to the fact that they were widely viewed as being knowledge workers. The methodology including the research design and supporting philosophy is presented in Chapter 3 before presenting the findings of Study 1 in Chapter 4. Study 1 is an exploratory case study in a small software development house based in the East Midlands in the UK. This setting was selected, as previously stated, due to the fact that the IT sector was widely regarded within the literature (Chapter 2) as being appropriate from an occupational perspective for the study of knowledge workers. In this study the knowledge worker archetype is examined in greater detail in relation to the research objectives, with the findings from the study allowing for refinement of the key variables relating to

knowledge workers' perceptions of their work and organisation. It also allowed for additional pertinent variables to be identified for further analysis in Chapter 5. Chapter 5 details the development of the archetypes using the O\*NET occupational classification establishing the knowledge worker archetype as software developer (in line with the literature and focus of study 1). A non-knowledge worker occupational archetype is established here (as a database/network administrator) to use as a contrast, or counterpoint, in generating understandings regarding knowledge workers (akin to the use of routine workers or traditional workers presented in Chapter 2). In Chapter 5 the theoretical framework is established in order to examine the archetypes in detail. The framework is based upon the themes relating to knowledge work which emerged from the literature and Study 1 (Chapters 2 and 4 respectively). This framework is established around the job characteristics model (JCM), as the key features of this model were found to be prominent within the literature review, the features of the archetypes and the exploratory study. Additional variables which had emerged were creativity, goal orientation, identification and commitment and these were combined with the JCM to establish the Knowledge Worker Characteristics Model (KWCM). In reviewing the literature relating to these variables a number of hypotheses were proposed to test the model in relation to the archetypes. Chapter 6 details the results of a cluster analysis which was performed to refine the occupational archetypes. The cluster analysis identifies that there are issues of difference at an occupational level which differentiates software developers into two distinct groups of web developers and programmers. Therefore the knowledge worker archetype is granulated down in occupational terms in order to more fully examine differences that exist within experiences of work. As a result of this refinement of the archetypes Chapter 6 goes on to detail the reconceptualisation of the KWCM and presents new hypotheses in relation to the reframed archetypes. Chapter 7 details the findings from Study 2 which was a global Internet based survey targeting IT workers, comprising of scales selected to test the KWCM and proposed hypotheses. The findings from Study 2 using the granulated archetypes demonstrate that there are some significant differences in the results between the two groups. It demonstrates an approach to investigating knowledge work where the work is the unit of analysis, drawing attention to the difficulties presented by high level discussions of knowledge work and workers. In Chapters 8 and 9 the final qualitative study is presented which focuses primarily upon objectives 3 and 4, whilst also exploring in greater depth the findings which emerged from Study 2. Study 3 is a qualitative study where respondents from the survey volunteered to participate in a semi-structured interview. In total 19 participants were interviewed using Skype (due to geographic location) and these were analysed according to their archetypes as web developers or programmers. The final chapter of the thesis draws together the findings from the three studies in relation to the refined archetypes and the

testing of the KWCM in line with the objectives set for this programme of research. The structure of the thesis is presented as follows in Table 1.1:

Chapter 1	<p>Introduction to the thesis</p> <ul style="list-style-type: none"> <li>• The post-industrial context</li> <li>• Research questions and objectives</li> </ul>
Chapter 2	<p>Knowledge worker literature review</p> <ul style="list-style-type: none"> <li>• Key theories, themes and characteristics defined from the literature</li> <li>• Context for study defined as IT work</li> <li>• Initial archetype vignettes presented of knowledge workers and non-knowledge workers</li> </ul>
Chapter 3	<p>Methodology</p> <ul style="list-style-type: none"> <li>• Research philosophy</li> <li>• Research design</li> <li>• Data collection and analysis methods</li> </ul>
Chapter 4	<p><i>Study 1 – exploratory, qualitative study</i></p> <ul style="list-style-type: none"> <li>• Knowledge Worker archetype as software developer</li> <li>• Exploration of themes emerging from Chapter 2</li> <li>• New themes emerging from the data</li> </ul>
Chapter 5	<ul style="list-style-type: none"> <li>• Occupational archetypes established from O*NET categories as software developer (knowledge worker) and database administrator (non-knowledge worker) – vignettes presented</li> <li>• KWCM presented with supporting literature</li> <li>• Hypotheses established</li> </ul>
Chapter 6	<ul style="list-style-type: none"> <li>• Findings from cluster analysis presented</li> <li>• Refinement of occupational knowledge worker archetypes to programmer and web developer</li> <li>• KWCM and hypotheses redefined</li> </ul>
Chapter 7	<p><i>Study 2 - Global Internet survey</i></p> <ul style="list-style-type: none"> <li>• Findings presented in relation to hypotheses established in Chapter 6</li> </ul>
Chapter 8	<p><i>Study 3 - Semi-structured interviews</i></p> <ul style="list-style-type: none"> <li>• Presentation of findings relating to exploration of KWCM variables and findings from Study 2</li> </ul>
Chapter 9	<p><i>Study 3</i></p> <ul style="list-style-type: none"> <li>• Discussion of findings relating to emergent and people management related themes</li> </ul>
Chapter 10	<p>Concluding discussion</p>

Table 1.1 Thesis Structure

## 1.5 Conclusion

This thesis addresses the issues which arise from the context presented in section 1 calling for a renewal of interest in the nature of work in the post-industrial context. Issues which have plagued the knowledge work debate regarding definition and the accusation that the term knowledge worker refers to everyone yet no-one (Davenport, 2005) are addressed by focusing upon specific archetypal workers whose perceptions of work and of those they work for can be examined. In establishing a knowledge worker archetype and theoretical model it allows the discussion to move away from the issues of definition to a greater understanding of new occupational types and different approaches to management. This thesis therefore details a programme of research which seeks to further understand work in the contemporary context by examining knowledge workers and their relationships with organisations. This begins with a review of the literature in Chapter 2, detailing accounts of knowledge work(er) research which builds upon the contextual literature presented in this introductory chapter. The research philosophy and design is then presented in the methodology in Chapter 3.

## Chapter 2 Knowledge Work Literature Review

### 2.1 Introduction

This chapter details the review of the literature relating to knowledge work and knowledge workers. Much of the study of knowledge work has been undertaken to address the issues of understanding work within the post-industrial context as presented in Chapter 1. The discussion is framed within the language of knowledge, using terms such as knowledge work, knowledge workers and knowledge intensive firms to describe work and organisation within the knowledge economy (a term which is synonymous with the post-industrial society). Some of the literature in this field focuses upon knowledge management and upon the nature of knowledge (epistemology) in order to describe and evaluate how organisations have responded to this societal shift. It is considered by this researcher that boundaries have to be established in any area of study and therefore the parameters for this research are established to exclude discussions relating to the nature of knowledge in the abstract and to the management and retention of knowledge within organisational systems (where knowledge work(ers) are not directly referred to).

This review begins by presenting the literature which describes specific models of knowledge work(ers). It then proceeds to discuss literature which relates to occupational type followed by a focus upon worker characteristics. One of the key issues presented within the literature is the proposal that knowledge workers need to be managed differently to non-knowledge workers (or routine/traditional workers). Indeed this assertion is one which originally provoked interest in this subject for the researcher. Therefore literature relating to HRM practices is presented next in this chapter. The literature is then synthesised to create vignettes of the archetypes in order to establish clarity around the characteristics that are attributed to knowledge workers and non-knowledge workers before exploring these facets in Study 1. This review provoked the initial research questions of 'Who are knowledge workers and what is knowledge work?' and 'What are the key characteristics of knowledge work?' and aided in developing the archetypes in order to begin to answer these questions. It established that there was common belief that IT occupations and organisations were representative of the post-industrial, or knowledge based economy and particularly that software developers could be considered to be examples of knowledge workers.

As outlined in Chapter 1, the literature pertaining to knowledge work can be identified as falling broadly into three categories: that which provides a specific definition, or framework, for conceptualising knowledge work, that which classifies knowledge work according to types of

occupation and that which attributes certain characteristics to knowledge workers. These categories were tentatively suggested as being apparent in the literature, both by the researcher and other authors (Beaumont and Hunter, 2002; Kelloway and Barling, 2000). After substantial analysis of the literature, it appears that these categories remain dominant in the way that knowledge work and knowledge workers are conceptualised. Literature has been selected for review that relates either to the subject of knowledge work, to knowledge workers or to the management of this group of workers. A significant proportion of the literature was felt to be journalistic in nature, often referring to broad categories of workers located in the United States. This literature was not included in the final literature review as it was felt to be lacking in substance and would therefore add little of value in substantially furthering understandings of knowledge work(ers). It can also be said that whilst Drucker first adopted the phrase 'knowledge worker' (in the 1960's) and much of his work is related to this subject, this is similarly lacking in rigorous analysis of this group. Drucker's work trades upon a well-worn set of assumptions about a group of workers he has termed knowledge workers, or in latter years knowledge technologists (Drucker, 1994, 1999, 2001, 2002). He maintains that these workers have a certain set of characteristics and that they interact with organisations in a particular way but is not forthcoming in providing any empirical work relating to this group, their characteristics or behaviour. It could be concluded that Drucker has propositioned the management world into believing in a unique group of workers that operate in a knowledge economy but is reluctant to elucidate as to their identity. This research relies minimally upon Drucker's work other than to establish an historical backdrop to this study and the studies which precede it. Whilst reviewing the literature a number of studies were identified which establish specific frameworks or models for the further exploration of knowledge work which focuses upon the job itself. Therefore this review begins with an examination of the literature which seeks to define what knowledge work is.

## 2.2 Models of Knowledge Work

The following models of knowledge work vary in their level of empirical content but they all attempt to define knowledge work and what differentiates it from non-knowledge work. It should be noted that the terms non-knowledge work, routine work and traditional work are used by different authors here but within this study the term non-knowledge worker will be used as a representative term for those who are not engaged in this type of work and used as a counter point, or dyad to the term knowledge worker.

The following models establish a broad conceptualisation of knowledge work which facilitates further exploration of this type of work. Whilst the models vary in their levels of abstraction they are all

pertinent to the understanding of the context of this study and in determining the theoretical base. Blackler's (1993) normative conceptualisation of knowledge work examines the notion of knowledge work as the deployment of expertise within the organisation, illustrating the abstract aspects of knowledge work. Kelloway and Barling's (2000) work is then examined which suggests that knowledge work can be viewed as being on a continuum relating to the use of knowledge within the work. Frenkel, Korzynski, Donoghue and Shire (1995), Hislop (2008) and the EIU report (1998) establish key aspects of knowledge work which aid in determining what differentiates knowledge work from non-knowledge work. These distinctions are also supported by Despres and Hiltrop's work (1995) which begins to draw characteristics of the knowledge workers into the model, an approach which is investigated in greater detail later in the chapter.

Blackler (1993) developed a conceptualisation of knowledge work using activity theory. Whilst the original theory by Vygotsky is acknowledged, Engstrom's interpretation (1987 cited in Blackler, 1993) is used. The primary emphasis here is to examine organisations as activity systems by focussing primarily on the role of knowledge, from a social constructivist perspective. Blackler proposes that activity theory contrasts greatly to the objectivist interpretation of professional expertise. (Note that professional expertise is used here as a synonym for knowledge work and therefore Blackler is making an assertion about what knowledge work broadly is). The key strands to the argument are that expertise may exist in different forms other than an objective, universal, historically bound sense as it is constantly evolving and it exists as part of the dynamic interactions of the activity system. Also, that tasks undertaken by these experts are context based and these professionals become experts by engaging in a creative process rather than by learning 'established bodies of knowledge' (p879). Thus Blackler surmises that activity theory determines expertise as being the key to understanding knowledge work, as expertise can be defined as effective activity that is acted out within the activity systems of the society of which they are a part. A particular problem with this perspective on knowledge work is that, as previously mentioned, Blackler (1993) has already located knowledge work within the parameters of an understanding of professional expertise. If the author is defining this expertise in terms of effective activity one could question who determines what effectiveness is and whether there is a consensus on how it can be measured. Given the epistemological/ontological location of Blackler's discussion (1993) any objective measurement would be deemed to be an incomplete analysis of knowledge work. The interaction between the organisation and the individual is, from a subjectivist perspective, of primary concern here and is therefore useful in developing further understandings of contextualised expert knowledge. As such, however, it gives little insight into how knowledge work actually creates and maintains difference in

organisational dynamics. Due to the social constructivist bent of Blackler's thought piece it is useful to think of this model as an early conceptualisation of knowledge work but as one which could be troublesome to use in attempting to examine the domain in a more positivistic way. However, the notion of professional expertise as a prominent facet of knowledge work is significant in the field and therefore to be acknowledged and explored further in the qualitative aspects of this study.

Kelloway and Barling (2000) in their literature review identify the three dominant themes within the literature as being knowledge work defined by the nature of the tasks (specifically here in the balance between thinking and doing), knowledge work as an occupation and knowledge work as a set of individual characteristics which are all distinct from Blackler's constructivist/expert interpretation. All of these approaches are considered by Kelloway and Barling (2000) to be inadequate thus proposing that knowledge work is part of a continuum whereby knowledge work should be understood as a dimension of the work and therefore the focus should be upon the use of knowledge within the workplace, which demonstrates a similarity to Blackler's (1993) approach to knowledge work. The authors utilise Nonaka's fourfold model of knowledge conversion to define knowledge work as a discretionary behaviour (Nonaka, 1991a, 1994 cited in Kelloway and Barling, 2000). As a result they suggest that there are at least four types of knowledge work in organisations:

'...(a) the creation of new knowledge or innovation; (b) the application of existing knowledge to current problems; (c) the packaging or teaching...of knowledge; and (d) the acquisition of existing knowledge through research and learning.'

(Kelloway and Barling, 2000, p292)

The authors suggest that management of these workers (and consequently the management of knowledge) within the organisation is linked to '...the ability to elicit these forms of discretionary behaviour in the workplace' (p292). They do acknowledge that this model needs to be tested further in order to establish its validity. It could be suggested that this model is problematic as the literature used to support this model of knowledge work uses differing definitions of knowledge work. This is a substantial issue where definitional problems pervade the literature, in that, the same terms may be used to variously describe different types of work, occupation or context. This provides a somewhat precarious foundation for further empirical work whereby what appears to be a solid model, substantiated by other work, is weakened by definitional problems and the lack of consensus that abounds within the literature. This concept of a knowledge work continuum may be useful in considering the content of the jobs but it does not provide a compelling case that knowledge work is a new type of work nor that it is undertaken by a particular type of worker that couldn't be seen

within the 'old' knowledge work category of the traditional professions (architects, doctors, solicitors for example Cortada, 1998). If knowledge generation and application as a facet of work is insufficient in describing 'new' knowledge work then this model must also be deemed as being insufficient in contributing to the call to 'further understandings of this group'. The continuum of knowledge work according to Kelloway and Barling (2000) can be useful in considering the use and application of knowledge as a part of work but it is suggested that it would be insufficient to use this as a total measure with knowledge work residing at one end of the continuum and non-knowledge work at the other. Conceptually, it is difficult to accept that this is a new dimension of work and pragmatically, if the call to explore this group further is to be met, then some categorisation of knowledge work must be established before further empirical work can be forthcoming.

The work of Frenkel, Korzynski, Donoghue and Shire (1995) is one of the most significant pieces of literature in this domain, in that it attempts to reconceptualise the act of work rather than assign a label to an occupational group. This is premised upon the changing nature of work classifications and their obsolescence due to numerous factors, including reduced meaning in manual tasks, wider ranging uses of tasks and the changing concept of classifications of skills. They have attempted to go beyond what they see Drucker doing as the restatement of '...official broad occupational categories' (p778) and seek to distinguish the 'act of work' in terms of three dimensions (the predominant form of knowledge, the level of creativity and the type and level of skills). The authors have used the ideal types of the 'routine worker' and the 'knowledge worker' and have positioned these accordingly (Figure 2.1). They suggest that knowledge work relies predominantly on theoretical knowledge, requiring intellectual skills and demands high levels of creativity. In contrast, routine work requires contextual knowledge, predominantly action-centred skills and demands little creativity. The authors also plot five different occupations according to these categories (Figure 2.2). It is considered that this makes an interesting contribution to the knowledge work discussion, particularly the notion that, similar to Kelloway and Barling (2000), there are varying degrees of knowledge work. The acknowledgement by the authors that the use of 'ideal types' circumvents many of the issues relating to problems of definition, is significant to the research approach reported in this thesis. The use of 'ideal' types allows for comparison to be made across the three axes whereby the occupational instance is placed in relation to the two extremes of the routine worker and the knowledge worker. This approach however, whilst advocating the use of a continuum remains heavily reliant upon binary oppositions, or dyads, which anchor the axes in order to meaningfully discuss the differences that exist within knowledge work.

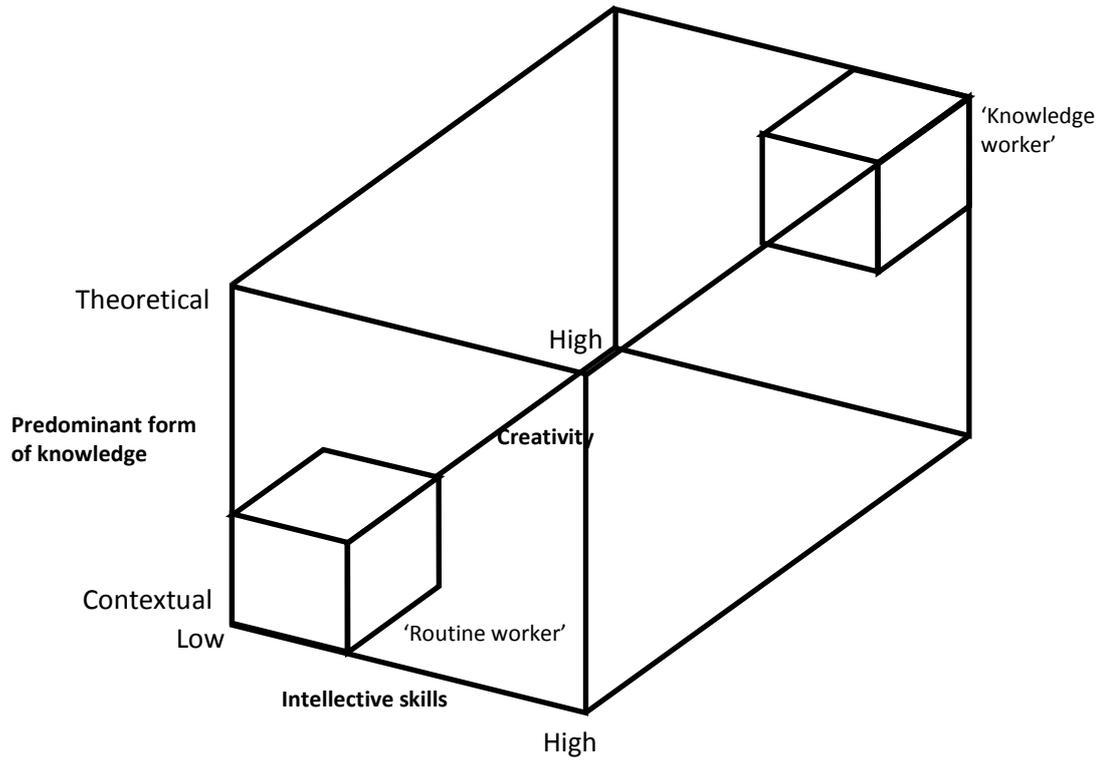


Figure 2.1 The Act of Work and Ideal Types of Work

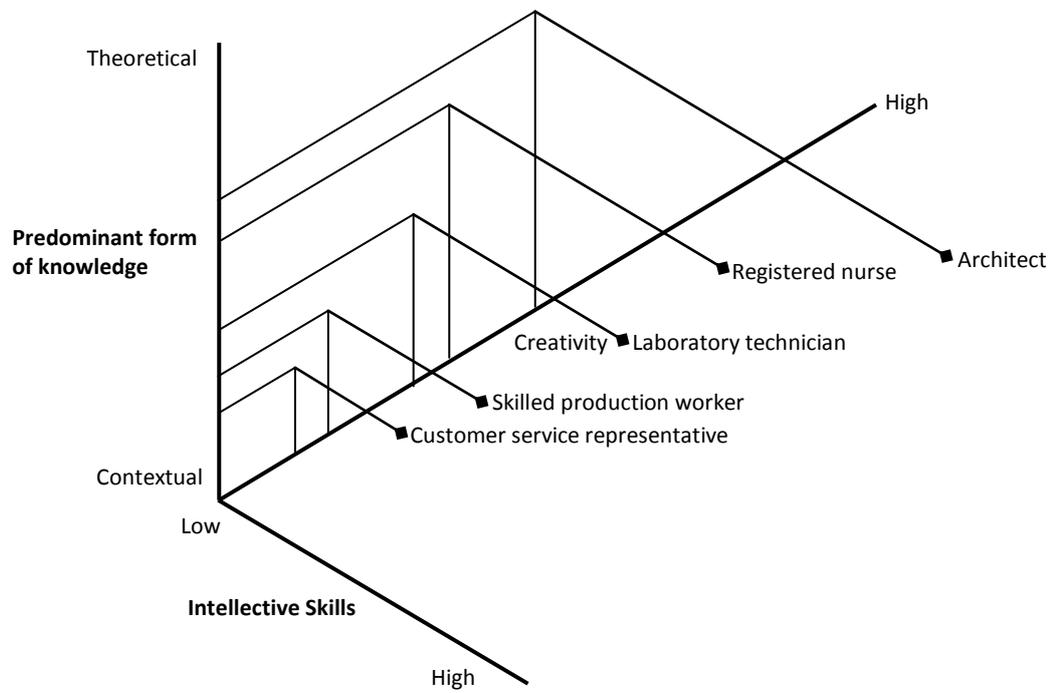


Figure 2.2 The Act of Work – Five Occupational Instances

Hislop (2008) builds upon the work of Frenkel et al (1995) using the framework to consider the work of management consultants and office equipment engineers through 18 interviews in 2 consultancies and 3 office equipment companies) emphasising the difference in knowledge and skill in defining the nature of knowledge work. The research suggests that there should be a de-privileging of theoretical knowledge in conceptualising knowledge work, as contextual knowledge can be considered as being equally descriptive of knowledge work. Although this could be considered to be problematic in that the centrality of theoretical knowledge was suggested as being the underpinning concept of the post-industrial transition (Bell, 1974). The reconceptualised model therefore proposes that skills and knowledge should be disaggregated and treated as different, but related, aspects of work. This then leads to the notion of 'exclusivist' professional knowledge work assumptions being replaced with the notion that all work can be described as knowledge work. Hislop (2008) particularly recognises the need for skill to be reinstated into the knowledge work discussion alongside recognition that both theoretical and contextual knowledge is of equal import. This notion of inclusion and discussion of skill is therefore adopted in this research study in considering the need to understand the fundamental aspects of work in the post-industrial context. Therefore this forms a key part of the KWCM theoretical framework (as part of the JCM) in examining key aspects of the job detailed in Chapter 5.

The Economist Intelligence Unit (1998) conducted a study entitled Knowledge Workers Revealed that endeavoured to 'fulfil a need for primary research into knowledge work' (p13). They suggest that there are three key aspects to understanding knowledge work: the knowledge worker, the knowledge work and the knowledge work systems (Figure 2.3). Whilst this was reported to be an exploratory study, the concept of knowledge work was to be predetermined in terms of its complexity and the level of interdependence that is required (Figure 2.4). There were also key characteristics of knowledge work that were outlined (Figure 2.5), although with little supporting evidence for the attribution of these.



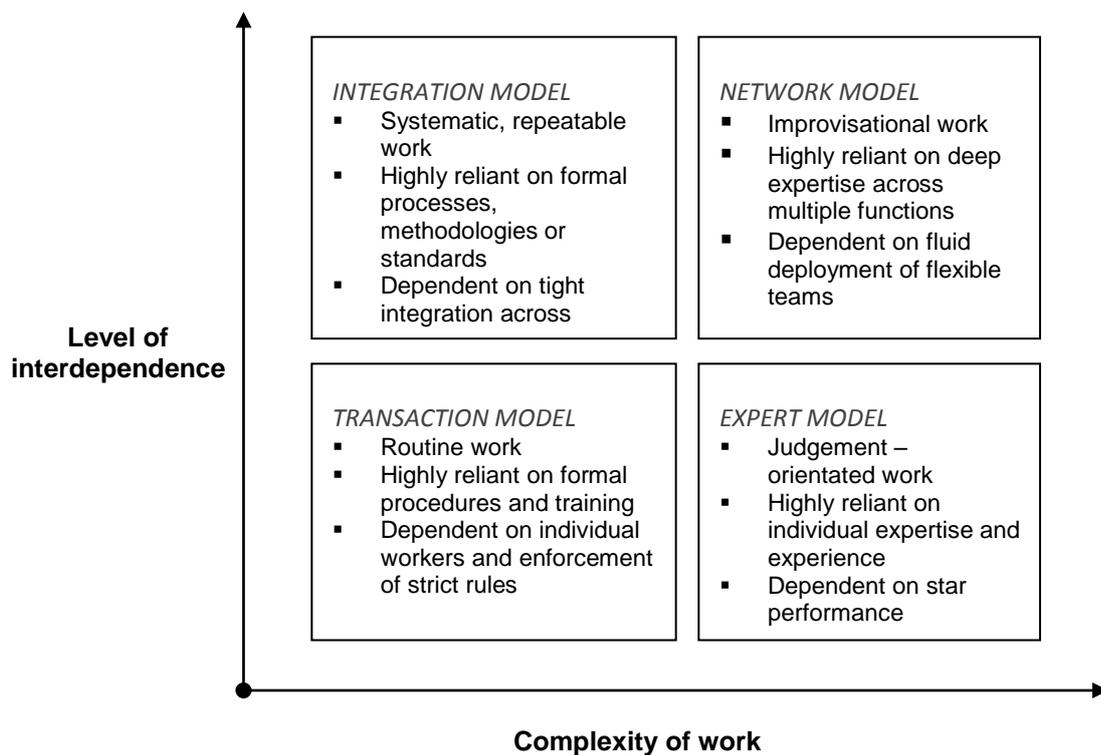


Figure 2.5 Models of Work

The general approach to the report was to examine issues relating to the attraction, retention and motivation of knowledge workers in an attempt to further understand ‘the nuts and bolts of knowledge work’ (p13) with a design premised on their own interpretation of what knowledge work is. The Knowledge Worker Survey was designed to assess work values in three groups: front line staff, sales staff and knowledge workers.

A number of issues can be identified with regards to this study particularly relating to the way that the workers have been categorised. The front line and sales staff were categorised on the basis of their job roles whereas the knowledge worker group was formed as a normative group termed an ‘ideal type’. There is difficulty in discerning from the report who determined these workers to be knowledge workers as this was determined according to subject self-report. There is also an assumption within the design of the survey that the knowledge workers will have similar work values to those of traditional workers. However, despite these criticisms, the notion that interdependence and complexity are the two aspects of work which determine whether work is either routine or knowledge work is of interest to this research as a contribution to the range of definitions and understandings outlined elsewhere in the literature. The complexity continuum is anchored at structured and unstructured problems with descriptors outlining the facets of the context. Similarly,

interdependence is anchored at high and low with the former being described as cross functional or team based in contrast to an individual focus. The Models of Work diagram (Fig 2.5) is helpful in categorising work according to interdependence and complexity of work which can be integrated into the data analysis within this study. It should be noted however that as this model is narrow in definition it is not fully representative of all that is considered to form knowledge work according to the wider body of literature. It is apparent from these models that work context is also considered to be of import when assessing the nature of work and the tasks in which a worker engages. It may also be suggested that task complexity, which appears in essence to describe problem solving, overlaps with the creative aspect of work identified by Frenkel et al (1995) and should be examined in greater detail to determine how this can be best addressed in the research design.

Despres and Hiltrop's model (1995), whilst focusing upon the content of the job, is also heavily reliant upon characterisations of knowledge workers and, as such, includes elements of both in the construction of their model. Thus, they suggest that there are fundamental differences that can be identified in what they term 'knowledge based work' (Figure 2.6). The authors suggest that:

'Knowledge workers manipulate and orchestrate symbols and concepts, identify more strongly with their peers and professions than their organisations, have more rapid skill obsolescence and are critical to the long-term success of the organization'.

(Despres and Hiltrop, 1995, p13)

Whilst the authors have suggested that knowledge workers have specific characteristics and that knowledge work is fundamentally different to traditional work, they are also found to be guilty of their definition of knowledge workers being 'everyone yet no-one' (Collins, 1997, p4) due to the lack of consistency in these definitions. Neither is there any empirical evidence to support their assessment of the new approaches that they propose are required with regards to reward management for this group of workers. However, this model is useful as an example of one method of understanding knowledge work by contrast to traditional work using a combination of job and person characteristics.

<p>Employees career formation</p> <p>Employee's loyalty</p> <p>Skill/knowledge sets</p> <p>Locus of work</p> <p>Focus of work</p> <p>Skill obsolescence</p> <p>Activity/feedback cycles</p> <p>Performance measures</p> <p>Impact on company success</p>	<p><b>Knowledge Work</b></p> <p>External to the organisation through years of education and socialisation</p> <p>To profession, networks and peers</p> <p>Specialised and deep, but often with diffuse peripheral focuses</p> <p>In groups and projects</p> <p>Customers, problems, issues</p> <p>Rapid</p> <p>Lengthy from a business perspective</p> <p>Process effectiveness Potentially great, but often erratic</p> <p>A few major contributions of strategic and long term importance</p>	<p><b>Traditional Work</b></p> <p>Internal to the organisation through training development, rules and prescriptive career schemes.</p> <p>To the organisation and its career systems. Narrow and often functional</p> <p>Around individuals</p> <p>Tasks, objectives, performance</p> <p>Gradual</p> <p>Primary and of an immediate nature</p> <p>Task deliverables Little (as planned), but regular and dependable</p> <p>Many small contributions that support the master plan.</p>
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Figure 2.6 Despres and Hiltrop's comparison of knowledge work and traditional work

Whilst this model was not developed from an empirical base it is considered to be a useful summary of the distinctions which are found elsewhere in the literature which assert that this group need to be investigated further and be considered as requiring different approaches to management. As such, this model serves well in summarising some of those themes within the literature pertaining to these binary oppositions. These distinctions will be returned to and assessed in relation to the current research when establishing a model for further analysis.

The broad conceptual models of knowledge work have been presented demonstrating the limitations of some of the work where there is over-reliance on prior normative models used in defining newer conceptualisations of knowledge work. These models collectively aid in identifying the defining features of knowledge work as including a requirement for high intellectual skills, high levels of creativity, high complexity, high levels of interdependence in the work, and complex theoretical knowledge application. At times the discussion of the work appears to be haunted by the spectre of the knowledge workers themselves whose characteristics will be discussed in further detail after consideration of the occupational groups which have been termed as being representative of knowledge work.

### 2.3 Classifying knowledge work according to types of occupation

A broad analysis of the literature demonstrated that, in addition to clear definitions of knowledge work and discussion of the characteristics of knowledge workers, occupations were frequently used to evidence the existence of knowledge work. In this instance, an analysis was undertaken by reviewing the literature and noting references to specific occupations that were attributed to knowledge work. A significant number of authors considered knowledge workers to be located in the traditional professions as accountants, legal professionals, educators, physicians, architects, religious ministers, engineers (Blackler et al, 1993; Reich, 1991; Cortada, 1998; Drucker, 1969, 1993, 1994; Garrick and Clegg, 2000). It is interesting to note however that the characteristics of creativity and innovation which are frequently attributed to knowledge workers in the knowledge work literature, are not easily married with conventional understandings of the traditional professions (or 'old' knowledge work). The claims that these professional workers were knowledge workers was disputed by some authors who considered that they showed traits of knowledge work but did not fit the criteria of working in the new knowledge economy (Bell, 1974). 'New' knowledge workers were frequently identified as being research and development workers, management consultants, scientists, software developers and analysts (Beaumont and Hunter, 2002; Blackler et al, 1993; Davenport et al, 1996, Storey and Quintas, 2001; Tampoe, 1993; Cortada, 1998; Elkjaer, 2000, Lee and Maurer, 1997; Newell et al, 2002; Dove, 1999; Garrick and Clegg, 2000;) and most attention is paid to these occupations in empirical studies. Other occupations which were mentioned infrequently were those of advertising and marketing, designers and public relations, ecologists and customer service workers (Blackler et al, 1993; Davenport et al, 1996; Newell et al, 2002; Elkjaer, 2000; Lee and Maurer, 1997). The difficulties with using occupations are apparent when considering Frenkel et al's study (1995) (see Fig 2.2) which suggests that a typical knowledge work occupation would be an architect and routine work could be represented by a customer service representative, termed by Davenport et al (1996) as a knowledge work occupation. The range of occupations which are considered to represent knowledge work suggest that using this as the sole method of defining knowledge work(ers) is problematic and should not therefore be used in isolation. In this research the knowledge workers characteristics are converted to knowledge work variables and used to select the archetypal occupations. As aspects of knowledge work and occupational definitions have been examined the third theme within the literature relating to knowledge worker characteristics is now addressed.

## 2.4 Classifying knowledge work according to types of worker characteristics

As was alluded to earlier in the chapter, much of the work relating to the differences in managing knowledge workers has relied on the attribution of a range of specific characteristics to this group and its work. Purcell et al (2009) recognise the importance of engaging in problem solving to knowledge workers and suggest that they are highly independent in their approach to managing their work (which could be interpreted as being autonomous). Newell et al (2002) also assign the characteristics of autonomy, creativity, highly educated, expert and specialised to knowledge work(ers). Purcell et al (2009) include in this intrinsic motivation, high discretionary behaviour (work exceptionally long hours), continuous professional skill development and identification with the profession (a concept which is notoriously problematic). Whilst others such as highly skilled, (e.g. Davenport et al, 1996; Robertson and Hammersley, 2000), highly intelligent (Collins, 1997; Kelloway and Barling, 2000, Lee and Maurer, 1997), responsible for their own learning (Cusimano, 1995, Flood et al, 2001) and requiring high levels of discretion in their work (Davenport et al, 1996) are also presented within the literature. Many of the characteristics cited by authors are derived from and attributed to Tampoe (1993) who is frequently cited in early knowledge work literature, primarily due to the empirical nature of the study which was undertaken in R&D, software development houses and engineering firms. The sample was categorised into managers of knowledge workers (N=91), project managers (N=40), and team members: consultants, researchers, implementers and designers (N=191). The survey measured job satisfaction, nature of the work, working conditions and motivators. Factor analysis was used to establish the motivators which were subsequently determined as being personal growth, operational autonomy, task achievement and money. The latter is noted to be latent once the industry reward level is met and the diagram illustrates the type of impact that these motivations may have upon behaviours with a proposed model for managing knowledge workers (see figure 2.7 below).

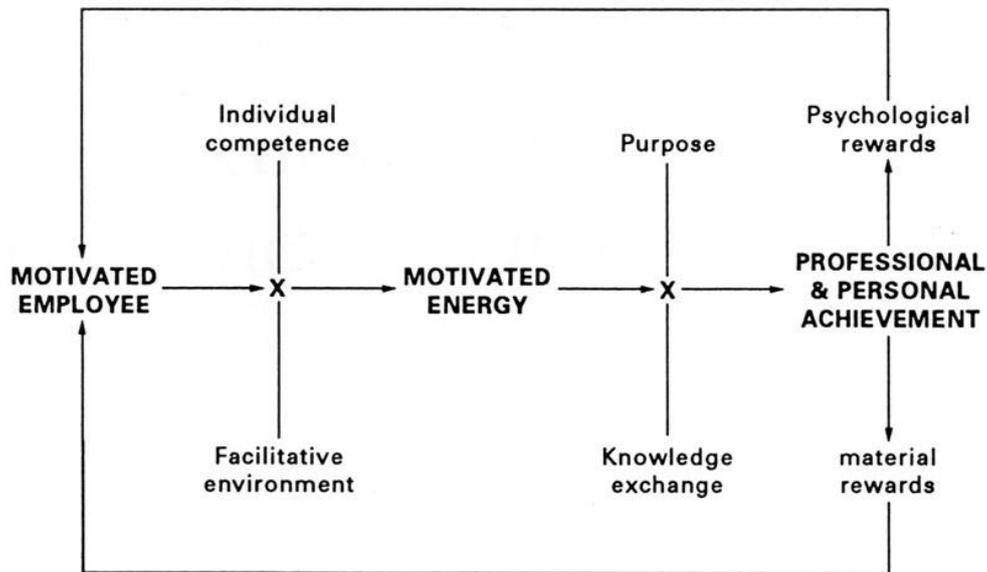


Figure 2.7 Motivating Knowledge Workers – The Challenge for the 1990s

However, the extent to which these workers can be considered to be knowledge workers is a matter of contention. This model is particularly exposed to criticism in that it is limited in its claims to be representative of knowledge workers as a discrete group, due to the high numbers of managers involved in the sample. Whilst managers could be considered to be knowledge workers their inclusion in the category may be problematic due to the different nature of their work. There are also problems related to the selection of the sample as an assumption was made that the organisations (R&D, software houses and engineering firms) contained knowledge workers as distinct from routine workers. Engineering firms and R&D workers, depending upon the context, may be contested by other authors as being representative of existing professions or 'old' knowledge work rather than 'new' knowledge work. Even so, the research provides interesting proposals about knowledge workers and their management, which may be used to explore these workers further. It should be noted whilst there are many references relating to knowledge work characteristics detailed previously it is unknown as to the extent to which Tampoe's work has influenced the conceptualisation of knowledge workers and the assertion that they need to be managed differently. Many of the later pieces of literature make reference to this work and therefore questions relating to the extent to which later work is of a genuinely objective foundation should be asked and can therefore be similarly applied to this study.

The literature relating to definitions of knowledge work, the occupations associated with knowledge work and the characteristics attributed to knowledge workers has been examined. The dominant themes relating to the characteristics of knowledge workers were those of requiring high levels of

autonomy, high levels of education, those who have problem solving skills and require variety in their work. These characteristics are frequently cited (e.g. Reich, 1991; Despres and Hiltrop, 1995; Newell et al, 2002; Davenport et al, 1996) as being the differentiators between knowledge workers and non-knowledge workers and support the notion that knowledge workers must therefore need to be managed differently. The literature relating to the characteristics of knowledge work also suggest differences in the ways in which tasks are managed and the individuals in relation to these tasks. Therefore, the literature pertaining specifically to this issue and to the characteristics which are attributed to these workers is now discussed in order to provide a more detailed analysis of this domain and thus determine what elements require further exploration in pursuit of the research objectives. This is not an exhaustive review of the literature as much of it does little to further understandings of the domain. Only salient work relating specifically to models of HR/people management practice or empirical studies are been discussed here.

## 2.5 HR Practices and Knowledge Workers

The suggestion that knowledge workers require different approaches to management was a significant part of Drucker's (1963) early work in this subject. Almost from its inception there was a presupposition of firstly, difference from traditional workers (including 'old' knowledge workers) and secondly, wide-ranging consequences emanating from these differences. Horibe (1999) addresses these issues by determining the need for a revision of practices relating to reward, sharing and learning and 'teamness', to name but a few which are perceived to be areas of difficulty for those who 'use their heads more than their hands to produce value...They still use their hands of course, but it's more likely to be inputting into a computer than lifting a 50 pound sack' (Horibe, 1999, pxi). This addresses perceived issues of managing the knowledge workforce primarily because they work with knowledge which appears to encompass management, sales, IT workers, accountants and researchers. Therefore the question must be asked as to where this difference truly lies if the roles have been in existence for a long period of time and have been, presumably gradually evolving to accommodate the demands of the knowledge economy. Davenport (2005) takes a similar approach to Horibe in addressing the knowledge economy/knowledge work (with specific attention paid to Drucker's original observations) accompanied by a range of organisational, systemic approaches to managing performance. It culminates by focusing on the individual approach to the performance management of knowledge workers suggesting a range of measures to improve this, with the caveat that all workers are not the same and the caution that a 'one size fits all approach' is guarded against. It is interesting to compare the contents of Horibe's work with that produced by Von Glinow (1988) *The New Professionals: Managing Today's High-Tech Employees*. The contents of this book

are similar in that these new workers are identified with a discussion as to their differences in relation to traditional professionals and a range of issues familiar to the knowledge workers literature including attraction, retention, reward, performance systems and career progression. The latter text identifies IT workers as being different types of professionals as 'In short, they are a new breed of worker, with strong professional ties' (Von Glinow 1988, p15). It is apparent, aside from the issues around definitions of knowledge work, that these issues regarding management of the knowledge economy workers is pervasive and is one which has continued to date in the literature. It is interesting then that these issues can be identified as pre-dating the knowledge work discussion, thus adding further weight to the choice of the research context which will shortly be detailed.

Newell et al (2002) also attend to the issue of managing knowledge work and knowledge workers drawing from a wide range of literature (including that relating to knowledge management) in relation to this subject but focusing primarily upon HR activities which have been, and those that should be, used in respect of these workers. A useful distinction is made in separating out conventional profession groups (lawyers, architects and doctors) where they are seen to work *from* knowledge located in a 'body of expertise' rather than *with* knowledge in the knowledge workers case. (It is also useful to note that software developers are used as an example of this type of worker who 'transform the objects of their work into symbolic form' (Whalley and Barley, 1997 cited in Newell et al, 2002, p70). Newell et al focus primarily on organisational culture, careers and reward systems as areas where HRM activities make a significant contribution to managing knowledge workers underpinned by the acknowledgement that best fit and best practice models of HRM are insufficient for this purpose. Themes such as social identity, trust and team working, subsumed within the concept of social capital are also considered to be relevant to the reformulation of HR practices for this group. Some of the discussions in relation to HR from Newell et al (2002) are problematic due to the inclusion of knowledge management theory and technique thus creating confusion as to the focus of attention. The overlap of these terms and the assumption that knowledge management is a significant part of managing knowledge workers is problematic and it is therefore difficult to use much of this work to support the development of the archetypes or theoretical framework within this study.

Swart (2007) suggests that the characteristics of knowledge workers (as previously outlined) such as strong intrinsic motivation, need for challenging work, identification with other like-minded professionals and their development of strong social networks can present severe challenges to employing organisations. The question arises as to whether traditional approaches to HRM and

people management can adequately meet these challenges. One of the issues which prevails in examining literature relating to HRM and knowledge work is that knowledge management and knowledge sharing proclivity is often conflated with knowledge work or identified as the primary organisational concern. Despite this, the emerging themes, observations and theory development relating to people management practices and HRM provides a firm foundation for the programme of research.

Lepak and Snell (2002) identified that as research moved from HRM to SHRM theory there was an increasing tendency to examine HRM as bundles of practices which could be applied, more or less so to specific employee groups. They note that 'such aggregation aids parsimony' (2009, p518) but suggest that this may mask differences between employee groups. They examine four different types or 'modes' of employment (knowledge-based employment, job-based employment, contractual work arrangements, alliances/partnerships) and HR systems used dependent upon levels of uniqueness of human capital and its strategic value. Quadrant 1 (high strategic value of human capital and high uniqueness) is occupied by Knowledge Based Employment represented by knowledge workers, using Horibe's definition (1999, pxi) as 'people who use their heads more than their hands to produce value' and whose employment is 'structured around the skills and competencies of employees rather than the execution of programmed tasks and job routines' (Lepak and Snell, 2002, p520). They proposed that the HR configuration would primarily be high commitment with a developmental orientation. The unit of analysis was the employment mode, whereby a sample of senior executives, HR managers and line managers responded to a questionnaire which asked the respondent to consider a specified employment mode (through 'visualising a particular subset of jobs' (p525)) and to detail the level of reliance on various HR practices relating to recruitment, job design, training and development, appraisal and compensation. It is interesting to note that the occupations which were identified by the respondents included artists, professional employees, engineers, salespersons and research scientists. Software developers and programmers were not referenced as examples of knowledge based employment but were identified within the alliance and contract modes. Salespersons, lawyers, accountants and engineers were included, identified as job-based modes of employment. This again demonstrates the difficulties which emerge from conceptualisations of knowledge-based employment and knowledge work and the assertion that these aggregations of workers seem to 'include everyone yet no-one' (Davenport, 1995). Lepak and Snell (2002) note that it is important to recognise that decisions about employment role in organisations in relation to specific jobs may differ as human capital value and uniqueness varies from organisation to organisation. They call for further analysis in this regard.

Despite this, the research here identifies that the commitment based HR configuration is significantly greater for the knowledge based employment mode than for the other three modes. The t-test results also showed that organisations use collaborative, productivity and commitment based configurations to manage knowledge workers. The authors acknowledge that there may be ‘a substantial disconnect between what firms should do and what they actually do’ (Lepak and Snell, 2002 p538) or indeed what they say they do, which is a difficulty when employees are not part of the sample. Further study could pursue comparisons with more traditional categorisations of employees in terms of bundles of HR practices, a call which is addressed in the second and third studies in this thesis. Lepak and Snell (2002) take the view that their research would have benefited from a deeper analysis of the overarching in-firm HR philosophies or ‘logics’ rather than focusing upon sub-systems.

Alvesson (2004) in his analysis of knowledge work and knowledge intensive settings, considers the importance of the personnel concepts of organisations given that their most prized asset is derived from the ‘quality and motivation of their personnel’ (p 138). The personnel concept is described as being the starting point for strategic HRM in the organisation and it relies upon an understanding of the prototypical employee that the organisation wishes to attract, motivate and retain. As with, Lepak and Snell’s research (1999, 2002), Alvesson (2004) considers that there is an ‘amplified’ issue of retention for KIFs and therefore a commitment focus is central to any HR policies and practices. Lowendahl (1997) illustrates this in a quote from a senior executive who considers that his firm’s resources go down in the lift every evening and that he considers it his job to make them want to return the next day. Alvesson concludes that satisfaction and loyalty are therefore important features of working life in knowledge intensive firms and should be addressed as fundamental aspects of the firm’s personnel concept. The challenge is to overcome the two extremes of ‘performance is input’ (human capital advantage approach) and ‘performance is outcome’ (human process) whereby the former is characterised by attracting and retaining the ‘brightest and best’ with the latter focused upon processes which add value to ‘adequate’ recruits via the design of work, team composition, culture and encouraging strong organisational identification. Alvesson argues that there are three strategies which can be varied according to organisational priorities: the best-people approach, systems and procedures approach and the clan or corporate culture approach. The best-people approach relies upon selecting the best people and retaining them through high individual rewards. The systems-approach requires robust systems which work upon adaptive employees with large scale investment into technocratic work practices. The clan approach is focused upon selecting employees on the basis of organisational culture and fit related to personality and attitudes as much as technical ability. It requires active management of the relationships between individuals and the

organisation in terms of establishing the prevailing culture, creating a social context and communicating clear values. The personnel concept is one that underpins the 'effort to define the motivational and developmental basis for the employer employee relationship' (Alvesson, 2004 p147). It is a philosophy or organisational idea of how the firm relates to its employees and develops its supporting HRM strategy, processes and practices. The author suggests that the personnel concept allows future research to illuminate some HRM themes relating to managing knowledge workers. This will be addressed in this thesis in Study 3 through an exploration of employees' perceptions of practices and processes, and broader conceptualisation of personnel.

As part of their management of knowledge workers Alvesson (2004) suggests that fundamental issues to be addressed by organisations in managing knowledge workers are commitment, identification and loyalty to the organisation. The use of the broader 'personnel concept' was evident in Purcell et al (2003) where one of the keys to the HR-performance link was considered to be that of 'the big idea' of a strong sense of organisational pursuit supported by a culture with embedded values and an outcome of employee commitment. Purcell et al (2003, p x) considered this to be '...a sort of glue binding people and processes together' with the role of front line managers being crucial as the embodiment of the big idea increasing positive attitudes and performance. Purcell and Hutchinson (2007) examined the issue of front line managers (FLMs) in greater depth as part of the performance causal chain with results demonstrating that FLMs were perceived to be the agents of the organisations in regard to HR practices by 'bringing policies to life' (Purcell and Hutchinson, 2007, p17). Indeed, there was deemed to be a symbiotic relationship between FLMs and HR practices with each requiring the other in order to effectively manage employees. There was a direct relationship between employees' positive judgements of FLM behaviour and affective commitment alongside positive aspects of the job. Whilst the research was conducted in 13 'excellent companies', rather than specifically KIFs or where knowledge workers are present, the findings reflect the contemporary organising of work and would therefore provide a valuable area of study in relation to the knowledge workers archetypes and people management practices. Similarly, whilst Purcell et al (2003) did not specifically examine the black box of performance from a knowledge work perspective they did suggest that professionals in contemporary organisations required organisations to provide significant job challenge and clear performance pay links. It is apparent therefore that studies within contemporary organisational settings demonstrate that practices derived from, or which exhibit the organisations' 'big idea', in high commitment practices, front line management behaviours, loyalty inducements through social measures and job challenge are prominent aspects of HRM today. It would be expected therefore that some, if not all of these, would feature in knowledge workers'

reports of HR practices therefore indicating their relative levels of usefulness in managing them. Purcell et al (2003) indicate that job design (linked to job challenge) should not be neglected from understanding the role of HR practices in eliciting performance, as it can explain much about an individual's experience of work and perceptions of the employing organisation (particularly with regards to the motivation and opportunity aspects of the AMO model). This emphasises the call (Barley and Kunda, 2001; Cappelli and Keller, 2013a) to further understand the nature of work in the post-industrial setting identified in Chapter 1 and signals that a bottom-up approach to understanding HR from the job and employee perspective would be complementary to the prevailing organisational approach.

Purcell et al (2009) provide greater clarity in their assessment of the relevance of HR practices to professional knowledge workers (PKW) by assessing the characteristics of this group and by application of the HR causal chain (Purcell et al, 2003) to the analysis. This model focuses upon actual rather than intended HR practices, emphasising the desired outcome as being high levels of positive attitudes (the focus here being upon commitment) and resultant behaviours, which feed into organisational performance. Practices which are expected to impact upon commitment are trust, teamwork, informal learning, influence over work, job challenge, sense of achievement, involvement and satisfaction with pay (see Fig 2.8 below). Purcell et al (2009) are clear about their definition of knowledge workers as '...employees who apply their valuable knowledge and skills (developed through experience) to complex client focused problems in environments that provide rich collective knowledge and relational resources' (p128). They also note that 'professional' knowledge workers are distinct from knowledge workers in their application of a body of professional knowledge in a variety of familiar and unfamiliar circumstances. 'Professional' may therefore be a term which is bestowed upon an occupation without the incumbents necessarily experiencing this affiliation themselves and therefore it could be considered a label which does not necessarily contribute to furthering understandings of the work or workers, merely constructing a different way of conceptualising it (Ashforth and Mael, 1989).

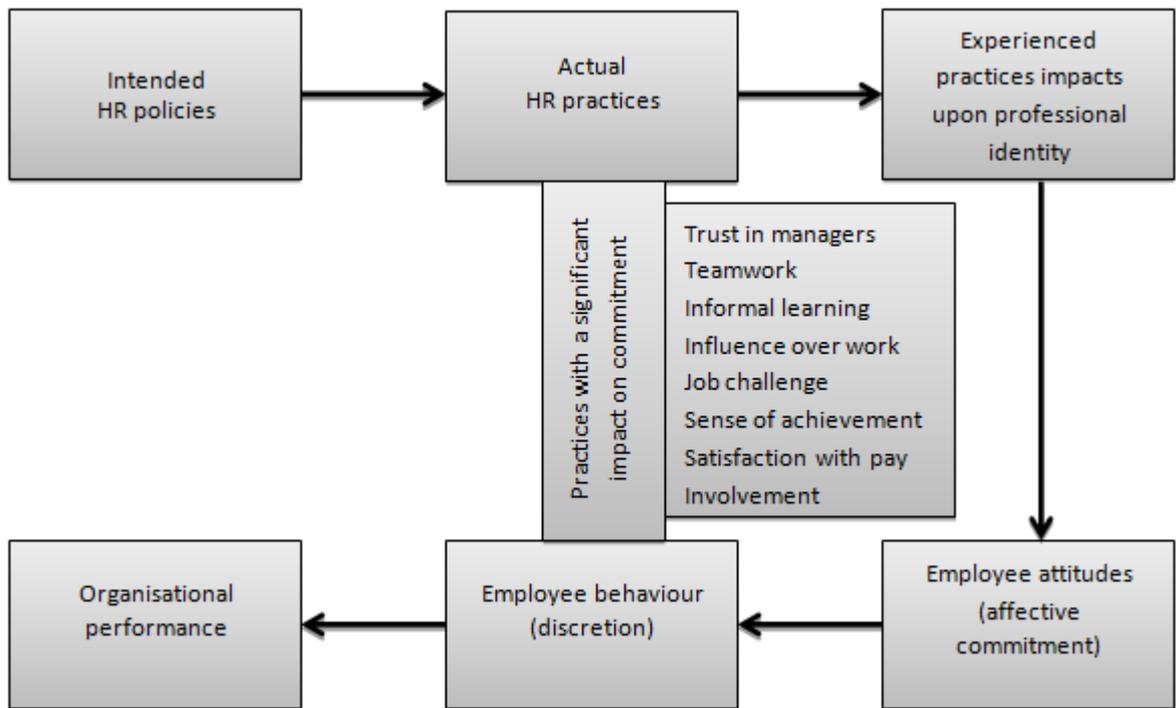


Figure 2.8 HR-performance causal chain for the PKW

Links between PKW, professional services organisations (PSO) and HR practices are made around the themes of know-what, know-how and the conditions to develop this, and individual characteristics. Recruitment and selection is seen as the primary HR practice to ensure that the body of knowledge is present which is then enhanced and ‘intertwined with practice’ (p134) in the organisation through informal learning systems, work organisation and appropriate resource allocation. The provision of challenging work through job design and work organisation are perceived as conditions required to support the development of ‘know-how’. Problem solving is seen as a key aspect of PKW which is also provided through learning (formal and informal) in work design and is set within the context of multiple teams and communities of practice. This detailed explication of PKW and associated HR practices is helpful in painting a clearer picture of knowledge work and how it may be managed. It could be argued that there is little in terms of best HR practice which is new here that could not be applied to routine work but it is more a matter of different context and emphasis which are of interest.

Hislop (2009) identifies that management of culture and HRM practices encourage knowledge sharing behaviours and therefore play a crucial role in managing knowledge and knowledge workers. This is premised on the notion that a knowledge worker is required to share and distribute their

knowledge in the organisational context bringing the management of these workers into the domain of broader knowledge management concepts. Despite this conflation Hislop (2009) notes similar themes to other commentators identifying that job challenge, commitment to the organisation, providing high levels of autonomy and the provision of development opportunities. In line with the studies previously outlined the primary method of managing knowledge workers is through managing the organisational culture through recruitment and selection activities for value congruence (Swart and Kinnie, 2003). The organisational culture can be managed through appropriate selection in order to stimulate and sustain desired group identities who work in roles that have been designed to provide challenge (Horwitz et al, 2003) and opportunities for development (Hislop, 2009). The latter is identified by Hislop (2009) as being crucially important to knowledge workers (Hunter et al, 2002 cited in Hislop, 2009) and presents its own issue of being a 'doubled edged sword' due to increasing their skills and consequently their opportunity to leave. There is some discussion as to whether development should be provided as part of HR practices within the organisation or stimulated and pursued by the individual knowledge worker. An interesting distinction that Hislop makes, with particular reference to the type of knowledge in KIFs, is that of individual technical knowledge (human capital) and client knowledge (social capital) in the workforce. The extent to which these aspects of knowledge work are significant is examined further in relation to knowledge workers' perceptions of HR practices.

Swart and Kinnie (2013) examined HR configurations in PSFs suggesting, as human capital is a central resource to these firms, that HR practices should play a central role in generating performance. 12 PSFs were studied (150 interviews conducted and 48 observations) from which two HR configurations were identified: the organisationally and professionally focused. Organisations were found to use both of these configurations either in a *targeted* or in a temporally *segregated* manner. The targeted segregation approach was found to be commonly used where there were different employment groups within an organisation such as administrative/support staff and fee-earning staff in law and consulting firms (Swart and Kinnie, 2013, p173). The former were managed using organisationally focused HR practices to generate high organisational commitment, reduce turnover, and develop firm-specific knowledge. The latter were managed using the professional model to generate industry focused knowledge with less concern for retention and commitment outcomes. The temporal segregation approach used differing approaches to '... deal with the tensions created by heterogeneous knowledge assets by varying the HR practices used for the same groups of professional over time' (Swart and Kinnie, 2010, p173). For example practices such as strong employer branding in recruitment and selection and induction (designed to induce commitment

through socialisation) were utilised for graduates. In the later stages of their career HR practices such as increased emphasis upon reward and performance management were strengthened. This demonstrates that organisations respond differently to their knowledge workers according to the organisational context. However, the perceptions of individual knowledge workers gathered in relation to objective 3 may elucidate as to the felt effectiveness of these approaches to the individuals concerned.

Much of the research relating to HRM investigates new ways of organizing work and how this influences HRM practice and process. As mentioned in the context section of Chapter 1 there has been significant interest in the nature of network organisations, the boundarylessness of organisations and the role that clients play in influencing the employment relationship. Swart et al (2005) suggest that the increasingly permeable boundaries which exist between firms in network organisations may lead to increased client influence, altered employee expectations and altered dynamics relating to knowledge ownership. In their analysis of two medium sized software houses the HR challenges of networked organisations were examined. They suggested that knowledge workers typically, in line with the previously discussed characteristics, worked exceptionally long hours, were committed more to the nature of the work, had a strong sense of internal motivation relating to job challenge and identified more closely with other high-tech professionals rather than their organisationally located colleagues (Von Glinow, 1988). They were also considered to work frequently in project teams (which may impact the type/flow of knowledge and require different HR practices (Swart and Kinnie, 2010) often with low degrees of control imposed due to the need for autonomy and decision making by the knowledge workers with self-directed development taking place. However, as previously mentioned, these characteristics are drawn from studies of a range of occupations and definitions of knowledge work. The two firms studied were slightly different in that one allowed the client to engage at a senior level whilst keenly maintaining a strong culture whilst the other allowed the clients to directly impact upon the daily people management activities. It is apparent therefore that the role of the client, the permeability of the organisational boundary and the nature of the work involved will impact upon the HR practices experience by the knowledge workers. Swart et al (2005) identify that the type of employment in terms of proliferation of contract workers and the location of workers at client sites may also significantly impact upon the extent to which clients affect HR strategy. One case study demonstrated this with high turnover exhibited in their full-time contract workers adopting reactive practices with little evidence of a strategic approach. The second case demonstrated a strategic high commitment approach to HR through focused recruitment and selection strategies, integrated reward systems and job allocation models

devised around learning and development. The assessment here overall was that knowledge workers tend to identify strongly with their profession and client and therefore the authors suggest that 'the development of conscious HR strategies emphasising integration and organisational identity may be a more sensible option in the networked organisation' (Swart et al, 2005 p20). Swart et al (2007) in their consideration of managing HRM across boundaries suggest that there may be difficulties in applying variations in HR configurations in highly networked organisations when trying to maintain equity when dealing with different groups working to different client expectations. It is also noted that the degree to which the client affects HR practices is dependent upon the nature of and strength of the relationship alongside the organisational, professional and client identities (Swart and Kinnie, 2003).

The findings outlined in this review demonstrate that knowledge workers may have different perceptions of HRM and people management practices than traditional workers due to different contexts for organising work and the impact of permeable boundaries upon the organisation, which should be considered when examining data in relation to objective 3 and in providing recommendations in relation to objective 4. Kinnie et al (2005) identify that increased understandings of 'best fit' practices designed for employees rather than for business strategy may be helpful particularly in developing HR configurations for occupational groupings, by capturing data relating to employee perceptions of HR practices rather than relying on manager and HR practitioner reports.

## 2.6 Research Context

In order to move away from the problems associated with re-examining professional workers (or old knowledge workers) knowledge workers should be ideally examined in a context which is undoubtedly considered to be part of the knowledge economy and which epitomises the post-industrial setting described by Bell (1974). It is apparent from much of the empirical work undertaken relating to knowledge work(ers) that research is located in IT firms and specifically within the software development population. This is unsurprising given that the IT sector has only been in existence since the 1980's and its growth trajectory appears to coincide with the rhetoric around the knowledge economy and cultural changes associated with the knowledge society (this rhetoric passed through a stage whereby the term 'information' such as 'the information age/economy' (e.g. Porat, 1978; Cortada 1998); was in common parlance and has now been superseded by 'knowledge'). Given the accepted importance of the IT industry in forming this post-industrial society, or knowledge economy, and its discrete historical location, the IT industry provides a context whereby knowledge work and routine work can be examined as genuinely new occupations. Given the

acceptance that the IT industry is a legitimate context for further analyses of knowledge work the extant knowledge work literature which focuses on this specific context is examined.

Horwitz et al (2003) examine the key HR issues relating to knowledge workers which were outlined previously by Purcell et al (2009). This research recognises the contextual factors surrounding knowledge work as being significant, specifically in relation to the labour market, the individualisation of employment practices and the predominance of team based working. This study is also concerned with knowledge management as a facet of a knowledge intensive organisation and one which impacts upon the other contextual factors. The IT sector was significant in the research used to underpin Horwitz et al's study and also in determining the context for the fieldwork, although the field work was selected to be broadly representative of knowledge based firms (electronics, IT, Telecoms, R&D in science and technology, venture capital and consulting firms and other including public sector). 200 organisations' CEOs and HR directors were surveyed with a return of 44 surveys (20.5 % from IT firms). IT firms are determined in Horwitz et al's study, in line with other studies, to be knowledge intensive and therefore an appropriate context for analysis of knowledge work. The study takes the approach that knowledge intensiveness is most appropriate in exploring knowledge work further rather than focusing upon a specific occupational category. The respondents were asked to define what they considered knowledge work to be before completing the survey. They were then asked a range of questions about the HR strategies that they employed and which of these were deemed to be most successful in attracting and retaining knowledge workers. It should be noted that, due to the position of the respondents in the organisation, it can only be assumed that the reported HR strategy is formulated but not that it is necessarily being practiced. With regards to the most popularly used motivation strategies the most highly ranked was that of freedom to plan work independently, second was regular contact with senior executives and incentive bonuses was ranked third. Performance incentives and competitive pay were ranked first and second as part of retention strategies with challenging work ranked third. The most highly effective strategies were reported as being challenging work, freedom to plan, competitive pay and access to leading-edge technologies. Least effective were deemed to be flexible work practices. The operationalisation and representativeness of these responses in relation to the organisations' populations is debatable but even so, these results give a sense of the organisational view regarding knowledge work and related HR strategies which can be used to further understand organisational responses to these workers.

Marks and Scholarios (2007) use the occupational category of software developers as prototypes of knowledge work to examine their characteristics in terms of relationships between qualifications, skill level, work role and organisational identification. The findings of the study demonstrate that there is a substantial difference in software development work that can be attributed to entry qualification, which impacts upon occupational identity but not upon professional identity. Marks and Scholarios (2007) recognise that there are issues regarding what constitutes software development work which they acknowledge are inherent more generally in the domain in the 'implausibly broad definitions of knowledge workers' (p113) of Drucker. They also acknowledge that there may be routine work taking place within such a broad occupational category as software development. This is likely to be the case given the explanation of the sampling procedure, as the organisational context, rather than the job content, is used as an indicator that software development work was occurring. The broad term software developer is used frequently, by developers themselves, as a way of communicating to non-technical people the essence of their role in reasonably understandable terms. If, for example, a nurse were to answer the same question they might also describe the type of work which they undertake as community or mental health nursing etc but this presumes a certain level of knowledge on the part of the other to allow context for the conversation. The general level of knowledge in the population around IT work would render much more detail beyond 'software developer' or 'computer programmer' as being too technical and as useless in providing any more information than that which was originally communicated. This is not unique to IT work but is suggested to be symptomatic of any highly technical role which is beyond general appreciation. This is important and is addressed within the research design in Study 2 in order that sufficient detail of the roles is collected to allow for more detailed interrogation of the data.

## 2.7 Establishing knowledge worker/non-knowledge worker archetypes

In order to establish a preliminary model for use in investigating knowledge workers and their relationships with organisations two archetypes are now established and presented as vignettes. These are drawn from the findings in the aforementioned literature pertaining to features of knowledge work(ers) and characteristics attributed to knowledge workers. These are presented in order to establish a dyadic construct using the non-knowledge worker archetype as a counterpoint to the knowledge worker archetype.

## 2.71 The knowledge Worker Archetype

Knowledge work is considered to be primarily focused around problem solving and creativity whereby the tasks are considered to be highly complex (Despres and Hiltrop, 1995; EIU, 1998). As Kelloway and Barling (2000) suggest, the work is primarily related to the creation and application of new knowledge. Knowledge work requires high levels of autonomy (Alvesson, 2004; Newell et al 2002) due to nature of the work. It is also suggested that the foci of this work, according to Despres and Hiltrop (1995) is group and project work and it is likely that knowledge work will have lengthy feedback cycles due its complexity. Knowledge work is also characterised by complexity in terms of the degrees of detail required, the imprecise nature of the inputs and the extended time horizons (EIU, 1998). Knowledge workers are typically suggested to be highly autonomous in the way that they work and are suggested to be independent characters (Purcell, 2009; Newell et al, 2002; Tampoe, 1993, Davenport et al, 1996). Knowledge workers are suggested to seek out problem solving opportunities and are highly creative in their work (Reich, 1991; Despres and Hiltrop, 1995; Newell et al, 2002; Davenport et al, 1996). They are determined within the literature as being highly educated with the ability to make decisions (Bentley and Yoong, 2000; Wickramasinghe and Ginzberg, 2001) and to engage in complex problem solving. They are considered to have greater loyalty to and identify more strongly with their professions and networks rather than their employing organisations (Despres and Hiltrop 1995, Purcell et al, 2009). The literature suggests that they are autonomous individuals (Purcell et al 2009, Tampoe, 1993) whose motivations are related to high personal growth (Cusimano, 1995) which relates to the speed of skill obsolescence which is identified as being a facet of knowledge work (Despres and Hiltrop, 1995). High levels of intrinsic motivation and discretionary behaviour are also attributed to knowledge workers (Davenport, 1996; Tampoe, 1993; Swart 2007; Alvesson, 2004; Hislop, 2009).

The challenges in managing these workers are apparent in the need to recognise the complexity and creativity that is inherent in the work (Swart, 2007). Some of the key issues pertaining to these challenges are detailed by Purcell et al (2009) with some evidence provided by Horwitz et al (2003) as to current practices which are used to manage knowledge workers. It could be suggested that the prevailing HR challenge is to be able to adapt large and relatively inflexible HR systems to accommodate the needs of these workers who are deemed to be highly independent, creative and autonomous (Swart and Kinnie, 2013a; Lepak and Snell, 2002; Swart et al, 2005). Reward systems may also be affected given the high levels of intrinsic motivation which are attributed to knowledge workers (Tampoe, 1993) and their desire for challenge in their work (Purcell, et al 2009; Swart, 2007; Hislop 2009). The appropriateness of performance management systems may be called into

question given the complexity of the tasks being performed and their definition largely resting with the individual worker rather than their manager.

## 2.72 The Non-Knowledge Worker Archetype

Non-knowledge work is infrequently discussed in detail in the literature other than as a counterpoint to discussions of knowledge work. Although this may be because adequate knowledge of traditional work is assumed to be present in the readership. However, there are those authors who address non-knowledge work specifically as routine work (Frenkel et al, 1995) or traditional work (Despres and Hiltop, 1995). Non-knowledge work is described as having short time horizons and being narrow in scope (Despres and Hiltop, 1995). The job is perceived to be highly structured with low levels of creativity required and which require low intellectual skill and only contextual knowledge (EIU, 1998; Frenkel et al, 1995). Feedback cycles are considered to be immediate within non-knowledge work and the focus of the work is suggested to be at the individual level rather than the team level (Despres and Hiltrop, 1995). Levels of interdependence are also considered to be low within non-knowledge work (EIU, 1998) and therefore require less complex interactions with a narrower focus of the work. The workers are considered to demonstrate loyalty and commitment to their employing organisations and their careers, which are developed within the organisation. They are also perceived to suffer from gradual skill obsolescence and therefore need less frequent and intense development. Given this archetype description it is apparent that many HR systems and practices are designed to address the characteristics of non-knowledge work(ers), for example: internal career development mechanisms which are reliant on annual appraisal systems to identify training needs, clearly defined tasks and objectives which can be easily identified and measured, organisationally focused performance and reward systems which assume a homogeneous work force.

## 2.8 Conclusion

This analysis of the knowledge work literature serves to show that there is widely held belief that knowledge workers are a different group of workers working in specific work contexts, who require a different approach to management as they exhibit unique work-related characteristics and engage in different types of work. This research study endeavours to address this issue as outlined in Chapter 1 through the establishment of archetypal knowledge workers (and non-knowledge workers to serve as a counterpoint) who can be examined in order to determine the extent to which these claims are true. It takes an approach to knowledge work based in occupation, but seeks to establish whether there are specific attributes of knowledge workers in relation to their job roles which would help to refine the existing broad knowledge work definitions. Further, it draws implications for knowledge

worker management that expands our understanding of the challenges organisations face when generating HR practices for the management of these workers. It is apparent that archetypes are useful in establishing clarity around knowledge work (Frenkel et al, 1995; Depres and Hiltrop, 1995) but it is also important that the occupational focus is given appropriate attention in order to further analysis in relation to work and workers in the post-industrial context. This study would contribute nothing new to this subject matter if it were to merely replicate studies which have been conducted under the auspices of examining professional workers or R&D workers for example. Such work is well established and specific in its content and focus, and this study endeavours to bring some of these qualities to what has been a generally broad discussion of knowledge workers. Therefore IT work has been selected as an appropriate context for this analysis whereby knowledge worker and non-knowledge worker occupational archetypes are defined as the units of analysis. As part of this analysis the literature has indicated that there are a number of specific characteristics which receive consistent attention and therefore would warrant inclusion into this study. Extant empirical work has demonstrated that greater clarity, particularly around knowledge workers perceptions, would contribute to knowing whether different people management practices are required and the extent to which they are necessary for generating motivated, committed, satisfied and high performing workers.

This chapter has described the literature relating to knowledge work, knowledge workers, their characteristics, HRM and people management practices in relation to these workers. This literature review goes some way to answering the initial research questions asked in Chapter 1 in order to establish who knowledge workers are and what their key characteristics are. This has allowed a knowledge worker archetype to be established using the literature alongside a non-knowledge workers archetype which serves as a counterpoint for discussion. This chapter has also established that a suitable occupational context for further analysis of the knowledge worker archetype is the IT industry. There are a range of organisational contexts described in the literature which have been used to study knowledge workers, particularly PSFs and KIFs although some of these organisations also include traditional professional workers and combinations of types of work. In order to examine knowledge workers, as workers who engage in unequivocally post-industrial work, IT occupations were deemed to be most appropriate, particularly that of software developer as this was consistently agreed upon in the literature as being representative of knowledge work. The next chapter details the methods used to meet the stated research objectives and the programme of research undertaken and presented in this thesis.

## Chapter 3 Methodology

### 3.1 Introduction

This chapter presents the philosophy and design of the research programme detailing the methods used to address the research questions and resultant objectives presented in Chapter 1. In Chapter 2 the review of the literature identifies the key features of knowledge work, knowledge workers (as archetypes) organisational settings and HRM practices for further investigation in the programme of research. At the conclusion of Chapter 2 archetypes were established from the literature presented as the foci of the study of knowledge workers. These were established as knowledge workers and non-knowledge workers as a counterpoint for analysis. The methodology details here the programme of research commencing with the research philosophy. The design uses a multi-method approach which is borne out of the researcher's epistemological and ontological position, taking a particular view as to the conceptualisation of the researcher as a 'bricoleur' (Denzin and Lincoln, 1998). The research design for Study 1 is then detailed as an exploratory case study in a Software Development firm which was used to develop a conceptual framework for the analysis of the archetypes. The second study is then presented which was used to test the conceptual framework in respect of the archetypes. The sample was defined using an occupational classification methodology and knowledge work variables derived from the literature review which allowed for further refinement of the archetypes to occupation specific units of analysis, with knowledge workers as software developers and non-knowledge workers as database/network administrators. The survey was designed using relevant scales in order to test the hypotheses and examine the established conceptual framework. This was published on the web and gathered data from a global population of IT workers. The occupational archetype was re-examined by reapplying the job classification methods and by using a more sensitive method in order to stratify the sample occupations. The sample was consequently adjusted as it was found to show greater levels of difference in knowledge work characteristics in the broad software development occupational category than anticipated. This occupation was granulated down into web developers and programmers as the primary knowledge worker archetypes. Therefore, the analysis of the data focuses upon two granulated occupational knowledge worker archetypes in order to address the stated research objectives rather than using the non-knowledge worker archetypes to counterpoint the knowledge worker archetype analysis. The final study builds upon the analysis from Study 2 by conducting semi-structured interviews with web developers and programmers. It examines themes relating to knowledge work and the KWCM and also relating to HRM practice, in order to address research objective 3. The three studies establish a set of findings using the workers as the unit of analysis moving from exploration of the

key variables in Study 1, to testing of the hypotheses in Study 2 to deeper examination of the subjects in Study 3. The design of the research in relation to addressing the research questions and resultant objectives is explicated in this chapter in relation to the three studies with details of the rationale for the methodological choices made, both in terms of their inclusion and exclusion from the programme of research. The research philosophy will now be addressed.

### 3.2 Research Philosophy

The research strategy, developed in order to meet the stated objectives, should be understood as being located within the researcher's personal view as to the nature of knowledge, reality and the personal values of the researcher. Much discussion relating to research philosophy invites the reader to consider the opposing epistemological stances of positivism or interpretivism and ontological positions of objectivism or subjectivism. It is acknowledged by many that research conducted within the natural sciences is traditionally located within the positivist and objectivist philosophies. In contrast, that which is concerned with social phenomena, specifically within the social sciences, is located at the interpretivist/subjectivist end of the continuum. Whilst much discussion utilises these positions as clearly differentiated anchors, these binary oppositions are considered to be interspersed with other research philosophies which capture gradations along the ontological and epistemological continuum (Guba and Lincoln (1998). Continua presenting alternative paradigms propose that realism can be considered as an alternative ontological paradigm (although this varies in terms of the extent to which it is included as a separate categorisation from positivism). It is suggested here that the term post-positivism can be used to describe a critical realist ontology, modified dualistic/objectivist epistemology with a 'critical manipulism' (p205) emphasis to the methodology (Guba and Lincoln 1998), whilst others suggest that realism describes a separate epistemology to positivism, rather than an overlapping concept (Saunders et al, 2007). Despite the linguistic and categorisational nuances it remains the case that the broad view of realism is that it describes a position whereby reality is described as being a separate and knowable construct which is apprehendable as closely as possible, but never entirely perfectly. The researcher acknowledges the range of approaches to epistemology and ontology within discussions regarding research philosophy and locates herself within this broader realist categorisation. Indeed it is considered by Van de Ven (2007) that realism is a research philosophy which shares principles of both positivism and interpretivism.

It is suggested therefore that post-positivism is best used to most adequately describe the researcher's view which tends towards a realist, objectivist perspective but which also acknowledges

that there is a significant social dimension which ensures that the rules of natural sciences cannot be applied in the same way in the social sciences. As such, the researcher would agree with Van de Ven's critical realist perspective that 'there is a real world out there, but our attempts to understand it are severely limited and can only be approximated (2007, p14)'. However, the nature of approximation from the researcher perspective would be more in line with the broader realist view of 'an objective ontology that presupposes the existence of mind-independent reality and the ability of a theory to capture partial aspects of reality' (Van de Ven, 2007 p 63). This also resonates with the work of Huberman and Miles (1994) who term themselves '...transcendental realists in the belief that social phenomena exist in the objective world and that there are some lawful, reasonably stable relationships derived from 'sequences and regularities that link phenomena together' (p429). In this case the researcher considered that the research design should pursue this course.

The researcher's realist or 'post-positivist' philosophy does not rest easily in either of the 'traditional camps' of positivism or interpretivism with regards to the assumptions made regarding the phenomenon studied, the role of the researcher or the development of knowledge resulting from the study. With this in mind there is a need to consider the role of theory development within the design of this research programme and how it relates to the researcher's own philosophy and approach to research. A positivist philosophy is most usually aligned with a deductive approach and interpretivist philosophy with an inductive approach. However, there is acknowledgement that combining both approaches can be desirable and advantageous particularly when considering the benefits which are linked to mixed method approaches (Saunders et al, 2007).

### 3.21 Inductive and deductive approaches

In this research study, given the researcher's aforementioned philosophical position and the stated objectives a combination of inductive and deductive approaches were taken. Study 1 built upon the literature review exploring, in an organisational setting, the themes emerging from the literature by taking a broadly inductive, qualitative approach which addressed objectives 1, 2 and 3. This was undertaken in order to provide a foundation for the development of a theoretical model and hypotheses which could be tested to further address objectives 1 and 2. Study 2 therefore broadens out to gather data from a global sample in order to test the hypotheses and to examine the relationships between these variables. Study 3 builds upon the deductive approach taken in Study 2 in order to establish a richer and deeper understanding of the subject further addressing objectives 1, 2 and 3, with the complete programme of research addressing objective 4. The programme of primary research moved, in terms of its 'thickness of description' (Blumberg et al, 2011, p19) therefore from a deep and rich phase to a broader scope before returning to a richer data collection

phase. Given the researchers stated realist approach the combination of inductive and deductive approaches allow the objectives to be met through the development of the research programme in building layers of data which are both deep and broad, with each study building upon the last.

### 3.22 The researcher as Bricoleur

The research design has been constructed, from the researcher perspective in the manner of a 'bricoleur'. This term is used by Denzin and Lincoln (1998, p3) in the context of qualitative research methods but it can equally well be used to describe research from both interpretivist and positivist traditions. The term bricoleur describes one who is a 'jack of all trades or professional tradesperson who produces 'bricolage': ' a pieced together, close-knit set of practices that provide solutions to a problem in a concrete situation' (p3). In other words, it is an emergent construction which comprises of whatever tools and skills are available and most applicable to a particular scenario. The notion of the researcher as 'bricoleur' is of particular interest in relation to this project as it resonates with the researcher's own desire to produce research which is applied, and which is pragmatically constructed rather than philosophically abstracted. Tashakkori and Teddlie (1998) note the appeal of 'pragmatism', rather than epistemology or ontology, as the driving force beyond research design in that it allows research to be borne out of what is of interest and of value rather than claims of truth and reality. However, as this research programme is constructed from a broadly realist perspective the broad issue of generalisability in relation to the strategy taken is now discussed.

### 3.23 Generalisability, Reliability and validity

Whilst issues relating to validity and reliability are dealt with later in this chapter in relation to the choice of specific data collection methods for each of the studies there is a broader implication of the researcher's philosophy and therefore the importance and understanding of generalisability and implications of that for the research findings in relation to fulfilling objective 4. However, there is also the broader question of how generalisability is considered in relation to the research philosophy and methods used within this programme of research. The realist or post-positivist philosophy is considered by Guba and Lincoln (1998) as having the ultimate purpose of being explanatory, predictive and recognising that knowledge accumulates by a process of accretion which allows for generalisations to be made. However, the post-positivist philosophy as described by Guba and Lincoln (1998) suggests that the use of qualitative and inductive techniques should be seen as being concerned with achieving reliability and rigour rather than understanding and authenticity. The realist philosophy acknowledges however that there is need to understand subjective interpretations but that these may share similarities and pattern and therefore can be used, through evaluation of deep qualitative data as valid contributions towards forming generalisations (Potter, 1996).

The researcher believes that there is a knowable and apprehendable reality but that social reality is a more complex phenomenon than that which can be deduced from utilising only broad quantitative approaches. The research strategy reflects this in terms of the mixed method approach taken which acknowledges the researchers' view that both breadth and depth are important in terms of the understanding of the phenomenon studied in being able to adequately address objective 4 as this is considered to be most appropriate in providing pragmatic recommendations regarding people management practices and knowledge workers.

### 3.3 Research Design

A multi-method approach to the research design was taken in line with the stated research philosophy. The research strategy was developed in response to the research questions and stated objectives as suggested by Marshall and Rossman (1995). The objectives are restated as follows:

1. To examine knowledge workers' attitudes to and perceptions of their work
2. To assess how knowledge workers relate to their employing organisations
3. To explore knowledge worker perceptions of people management practices and HR activities used by organisations in managing knowledge workers.
4. To make recommendations as to how organisations can most effectively develop HR strategies and people management strategies in order to effectively manage knowledge workers

In order to address the research objectives 1-3 a case study was undertaken in the first instance to satisfy the exploratory aspect of the study in order to investigate the phenomena and identify relevant variables. Data was collected using semi-structured interviews in order to explore themes which emerged from the literature in establishing the knowledge worker archetypes and in order to build the theoretical framework of the Knowledge Worker Characteristics Model (KWCM). After this occupational classification methods were used to define the archetype, initially as software developer and database/network administrator and then latterly to granulate the software developer archetype to web developer and programmer archetypes, the theoretical framework was reconceptualised. The global survey was devised using scales which reflected the variables defined in Chapter 5 in order to address Objectives 1 and 2 in detail. The descriptive aspect of the research was then undertaken using this survey to address objectives 1, 2 and 3. In order to more fully explore the data gathered and analysed in Study 2 (detailed in Chapter 7). Study 3 was conducted which used in-depth interviewing to gather richer data related to the variables and relationships in the KWCM and

also in relation to Objective 3 regarding knowledge workers perceptions of people management practices and HRM activities in order to be able to make recommendations based upon the data collected (objective 4). The research design takes a mixed method approach in order to gain appropriate breadth and depth in answering the research questions and research objectives stated here in line with the stated research philosophy.

### 3.31 Study 1

Given the literature pertaining to knowledge work examined in chapter 2, and the numerous characteristics attributed to it, an exploratory study (which is broadly interpretivist) was considered to be an appropriate way of examining themes which emerged from the literature and in assessing whether there were other dominant themes which warranted further examination. This was an exploratory study located in one organisation which was designed to explore the key features of knowledge work derived from the literature review in order to develop the knowledge archetype, the theoretical framework and hypotheses for examination in study 2. This study examined knowledge workers attitudes and perceptions of knowledge workers, how they relate to employing organisations and perceive people management practices and HR activities used by the organisation in which they work.

#### *3.311 Exploratory Case Study*

It is suggested that the exploratory phase of a research study is imperative in creating greater clarity around concepts to establish priorities, define key variables, develop hypotheses and to supplement the initial phase of exploratory activity which is undertaken in the literature review (Blumberg et al, 2011). It was considered to be essential to the researcher in preparing for the 'broad' data collection activity, the development of the archetypes and model and related hypotheses, to consider the most appropriate techniques to use in the exploratory phase of the research programme. Blumberg et al (2011) suggest that exploration is generally best achieved by qualitative techniques including in-depth, conversational interviewing, role playing, participant observation and case studies. It was considered by the researcher that a single case-study organisation should be used in order to develop a deep understanding of the nature of knowledge work and knowledge workers within a context which is accepted in the literature as being appropriate for study (as it could be considered to be both a knowledge intensive firm (KIF) and a professional service firm (PSF)). IT, as detailed in Chapter 2 was widely considered to be a knowledge based sector with workers who characterised the post-industrial workforce. The literature pointed particularly to software developers as being appropriate representatives of knowledge workers and as such they were considered to be an

appropriate sample in which to explore the themes presented within the broad archetype vignettes presented at the end of Chapter 2.

A case study was deemed to be most appropriate by the researcher as this was considered to be a useful approach when building a theoretical framework as a foundation for further empirical research (Dane, 1990). Case studies are defined as an 'empirical enquiry that investigates a contemporary phenomenon within its real-life context' (Yin, 1984 p23 in Czarniawska, 1997). Case studies are considered to be useful in detecting patterns and potential explanations upon which theory can be built (Blumberg et al, 2011; Eisenhardt, 2001), deepening insight into the subjects studied and illumination of relevant experiences (Runyan, 1988). As the case study approach was considered to be most appropriate the question of whether single or multiple case studies should be used was then addressed. The researcher was mindful of the fact that this study was not designed to generate data which could be used to make generalisations to populations but was designed to be in itself generalisable to theoretical propositions (Yin, 1989). Nor was it designed to draw conclusions as to the nature of differing organisational contexts. The single study was designed to be used in conjunction with the literature rather than be purely inductive in nature and therefore the case study provides triangulation for theory development rather than driving it. A single study was considered to be appropriate as corroboration was not necessary regarding organisational context as the unit of analysis was the individual worker rather than the organisation. In conjunction with the literature reviewed the first study was designed as a preliminary exploration in pursuit of objectives 1, 2 and 3 upon which the foundations of a theoretical framework could be built through empirical observation. Whilst it could be argued that multiple case studies would aid in building a comprehensive foundation upon which to establish the subsequent studies it was considered sufficient in this instance for a single case study organisations to be used. This was determined, in line with the research philosophy, to be appropriate due to the exploratory nature of the study, the lack of need for generalisability and from the practical perspective of the bricoleur due to constraints related to accessibility and resources.

### *3.312 Data Collection and Analysis*

The method of data collection which was used in order to gather 'rich' data was that of semi-structured interviews. Other methods such as use of focus groups which are often used in exploratory studies were considered by the researcher to have generated insufficient richness and depth, particularly due to the use of a single group whereby individual perceptions and insights maybe tamed somewhat when aired in a more public domain. Observational methods and other questioning techniques (such as 20 statements, CIT) were deemed to be too constraining given the

exploratory nature of the study and the requirement to generate data which aided in building the knowledge required to inform the second phase of the study. Semi-structured interviewing was considered to be the most suitable method to use in this single case study, in order to generate the type of data required to contribute to a theoretical framework and hypotheses for testing which supports the author's realist philosophy allowing both inductive and deductive approaches to be taken, through interpretivist and positivist approaches in the spirit of the bricoleur.

The exploratory data collection was undertaken using in-depth interviewing which has been described as a "conversation with a purpose" (Kahn and Cannell, 1995, p149 cited in Marshall and Rossmann, 1995). Fourteen exploratory interviews, of approximately thirty minutes, were conducted within a small web development company based in Derbyshire, in the United Kingdom. This comprised of two managers, one financial controller, two designers and nine software developers. Of these interviews only nine were useful to this study in terms of their content, which were those of the commercial manager and eight software developers. A range of employees were interviewed in order to obtain a wider view of the organisational context and to obtain differing perspectives upon the nature of knowledge work and knowledge workers within this domain.

The company is owned privately and is run by a managing director who is also a shareholder who over-saw the establishment of the company as a break away from its parent company. Access was obtained through a personal contact of the researcher and the organisation allowed the interviews to take place during the working day in the board room. The researcher was asked for general feedback about the research findings regarding the motivation of employees and observations were requested as to any remedial action which may be useful for the organisation to take. The subjects were informed that the data would be confidential and would not be released to their employer or any excerpts be attributable to a specific individual. They were also informed that the data would be kept securely in such a way to ensure their anonymity (see Appendix 1).

The interviews were semi-structured in that prescribed questions were not used but the researcher used an interview guide with key points on it derived from preliminary work, personal knowledge and the literature (as advocated by King, 1994). Characteristics identified from the literature review and establishments of the archetypes were used to guide the interviewer in exploring the workers understandings of knowledge work, the features of their work and perceptions of the organisation in which they work. Neither the evolution of this guide nor the importance of flexibility in this process can be over emphasised when considering the importance of maintaining the conversational aspect of this approach (King, 1994). The interviews were recorded and then transcribed to ensure that all

of the data was captured accurately. Notes were also made by the researcher during the interviews to complement the recording with additional details of body language and non-verbal signals.

### *3.313 Issues of Validity and Reliability*

When considering the nature of these interviews it is essential that the interviewer evaluates their role in the process:

“Interviews must be viewed, then, as social events in which the interviewer (and for that matter the interviewee) is a participant observer...Interview data, like any other, must be interpreted against a background of the context in which they were produced.”

(Hammersley and Atkinson, 1983, p126 cited in Silverman, 1993)

Awareness of this participation should form part of the iterative, reflexive process of data collection and analysis for the researcher, whereby the researcher considers the status of this data as being that of ‘authentic experiences’ (Silverman, 1993, p91). The nature of these authentic experiences, the researcher role and the aforementioned conversational quality entwined in these data collection techniques may cause some to question the role of validity and reliability within these approaches. These issues are often associated with the positivist tradition but they can also be associated with qualitative methodologies. Hammersley (1990) suggests that, as reality is viewed through various perspectives, our accounts of data *represent* reality rather than reproduce it. As Silverman (1993, p155) suggests ‘validity is identified with our confidence in our knowledge but not certainty’. It is with this in mind that the term ‘trustworthiness’ is therefore used in relation to this programme of research replacing those of ‘validity’ and ‘authenticity’ when considering post-positivist research methods in the domain of social science (Denzin and Lincoln, 1998). In such a small sample qualitative study there is often an issue as to the generalisability of the findings. The concept of generalisability, alongside reliability and validity, has origins in the natural sciences and quantitative studies. Zyzanski et al (1992, p241) address the question of ‘How can you generalise from such a small sample?’ by suggesting that it misses the point as ‘the purpose of qualitative research is explanation and understanding, not prediction...it enriches our knowledge of particulars rather than giving us large generalisations’. These points apply equally to Study 3 in addressing a similarly small sample, albeit outside the organisational context of a single case study.

### *3.314 Analytical Framework*

In considering the nature of this study as one which is undertaken to explore key themes rather than one which seeks to test hypotheses, there is a need to identify the role of analysis and codification

within the data management process. It could be suggested that the process of assigning categories for codification should begin prior to the data collection (*a priori* codification) consistent with the notion of nomothetic knowledge. However, in this instance the researcher considers that an idiographic approach to knowledge is taken, in that prescribed categories will not be considered to be reflective of the true and unique aspects of reality that are anticipated to be derived from the inductive process. Therefore, *a posteriori* codification should take place whereby the reading of the data collected will begin to inform categorisation. Even with this latter approach Schwandt (1997) identifies that codification can prove to be problematic in that the process can restrict creativity as many researchers approach it mechanically ignoring prior conceptualisation that has occurred throughout the aforementioned iterative process of analysis and collection. The tendency to regard the codes and categories as fixed or unchanging has also been raised as an issue that the researcher is cognisant of (Schwandt, 1997). Therefore the researcher adopted a method of *a posteriori* codification which underpins the 'emic' approach to the data analysis and presentation of the exploratory project, consistent with the researcher's view that "interpretation is an art that cannot be formalized" (Denzin, 1994, p512). A broader approach to data analysis was also undertaken by employing some of the 'tactics for generating meaning' (Huberman and Miles, 1994, p432) such as noting patterns and themes and discerning metaphors as part of a thematic analysis.

It should be noted that the researcher also considered the use of content analysis, discourse analysis and conversation analysis as alternatives to an interpretive thematic analysis (ITA). The qualitative version of the former is concerned with discerning lexical and thematic units of analysis as opposed to the quantitative version of word-frequency appraisals. Schwandt (1997) suggests that this method is most appropriate for the testing of hypotheses rather than for theory building. Discourse analysis is described as 'talk as action' and conversation analysis is described 'talk as talk' (Czarniawska, 1998, p66) where 'language is the focus for study in its own right' (Marshall, 1994, p92). It was felt by the researcher that both of these methods focused upon the language in too much detail rather than generating descriptions of the subjects' experiences of the social phenomenon which was in line with the researcher's own philosophy. Therefore a thematic analysis was used to interpret the interview data.

Use of a broader thematic approach was considered to be congruent with the researcher's post-positivist approach in that the assumption that '...a simple, largely unidirectional relationship is assumed between meaning and experience and language (language reflects and enables us to articulate meaning and experience) (Braun and Clarke, 2006, p85). Braun and Clarke (2006) present

a useful guide through six phases of thematic analysis: familiarising yourself with the data; generating initial codes; searching for themes; reviewing themes; defining themes and producing the report. These phases were used in the research analysis, with some iteration in the middle stages of the process, revisiting and recoding themes throughout. The researcher was mindful of the 'potential pitfalls' of failing to analyse the data at all by ignoring patterns and themes whilst remaining closely wedded to the interview schedule and also the danger of reifying into a pattern a few instances of a phenomenon (Braun and Clarke, 2006, p95). These warnings were heeded by the researcher in the analysis phase and close attention was paid to the process to ensure that an insightful analysis was produced which answered the research questions and met the objectives of the study.

The results of the exploratory study, presented thematically, are detailed in Chapter 4 and demonstrate that there were key themes which supported the archetypes derived from the literature review. As anticipated, there were additional themes which emerged from the data which enabled the research programme to move from the inductive to the deductive phase in the development of the theoretical framework (Chapter 5) in developing the knowledge worker characteristics model and hypotheses for testing in Study 2.

### 3.32 Archetype development and development of theoretical framework

The findings from Study 1 and from the literature were used to develop a theoretical framework and hypotheses in order to study the knowledge worker archetype. The occupational aspect of the knowledge worker archetype was defined using the occupational classification data by developing key knowledge work variables from the literature and vignettes in Chapter 2. This established software developer and network/database administrators as being knowledge worker and non-knowledge worker archetypes respectively. Themes which had emerged from the Study 1 pointed to the use of the JCM as the primary architecture for the theoretical framework with the inclusion of the variables of commitment, creativity, goal orientation and identification as additional variables. Hypotheses were presented in Chapter 5 derived from the literature and findings from Study 1 to be tested in the IT population specifically in relation to the occupational archetypes of software developers and network/database administrators.

#### *3.321 Selecting the occupational archetypes using O\*NET classification*

As discussed in Chapter 2, it was apparent from the extant literature that occupational category was an important aspect of the examination of knowledge workers and their perceptions of their work. Within the occupational context of IT work there were a range of roles which could be considered to

describe knowledge workers and in contrast to describe non-knowledge workers. Given the use of software developer as a frequently used example of a knowledge worker this occupation had been selected for use in Study 1. It was anticipated that further analysis using an occupational classification system would support this selection given that the knowledge work characteristics used to establish key knowledge work variables for classification were derived from the same body of literature. Therefore, occupational classifications were used to determine which occupational categories could be considered to be archetypal knowledge workers (and non-knowledge workers). As there were a range of work and workers characteristics which were detailed within the archetypes (established at the end of Chapter 2) these were used in addition to pre-existing occupational classification data in order to establish appropriate knowledge workers variables to determine which occupations had the highest knowledge workers scores.

It was considered appropriate to use occupational classification methods which are internationally recognised and which have explicated methodologies. Two established and well-regarded occupational classifications are the Standard Occupational Classification (SOC) (Office for National Statistics, 2010) from the United Kingdom and the Occupational Information Network Database (O\*NET, 2014) from the United States. Both of these classification systems are administered by their respective governments; the former by the Office for National Statistics and the latter by the US Department of Labor. The classification systems will briefly be described, in terms of the methodologies employed before the list of occupational categories and the contribution to the archetypes is explained.

### 3.3211 Standard Occupational Classification (SOC)

Initially the Standard Occupational Classification (SOC) (2010) was reviewed to establish the relevant categories of IT occupations. This system takes a relatively broad view of occupational categories, aiming to establish categories which can be used for statistical purposes over time. In the preface to the 2010 Revision a tension is articulated regarding the need to establish precise, representative job classifications in contrast to establishing categories which allow interrogation of data over time (to analyse occupational trends for example). The SOC focuses primarily upon skills (skill level and skill specialisation) to differentiate between jobs and articulates the typical qualifications and tasks associated with the job alongside a list of related job titles. The classification system is updated every ten years with particular attention paid to areas which may have seen significant change over the decade (IT and telecommunications occupations being one such group). This group (which is part of Major Group 2 of professional occupations) underwent significant change in the way that the jobs were subcategorised and particularly in that Web Design and Development Professionals were

brought together into one group (after previously being split over the Professional Occupations groups and the Associate Professional and Technical Occupations group). Whilst this change reflects that there is ongoing, prolific technological change in this sector it does not necessarily reflect adequately the specific type of work that may be done due to the narrow range of categories used. It was particularly difficult to ascertain, given the amount of input from professional bodies and sectoral representatives, the extent to which these categories reflect actual organisational roles or constructed professional stereotypes (which ultimately legitimise and protect their overarching professional bodies). It was also difficult to ascertain specifically the precise nature of the tasks involved in each of the jobs, primarily because it doesn't attempt to detail the components of these jobs. The ICT professional group is divided into job roles 2135: IT Business Analysts, Architects and systems designers; 2136: Programmers and Software development professionals and 2137: Web Design and Development Professionals. Whilst this analysis demonstrated that there were clear distinctions in broad terms between what can be described as relatively new occupational types it was considered that the SOC provided insufficient detail to suitably categorise the range of IT occupations and there was inadequate information by which to determine which roles could be most clearly determined as being archetypal knowledge worker and non-knowledge worker roles. Therefore further detail was derived from the O\*NET system in order to establish the occupational categories.

### 3.3212 The Occupational Information Network (O\*NET)

The Occupational Information Network (O\*NET) is comprised of data currently pertaining to 812 occupations and is in its ninth analysis cycle (Willison and Tsacoumis, 2009). The database replaces the Dictionary of Occupational Titles which was commonly referred to within work design literature in the 1980's and 1990's. The data is comprehensive in that it includes reports on tasks, knowledge, skills, knowledge, education, work context and work styles as reported by the job incumbent, an objective analyst or an occupational expert which contrasts markedly with the SOC methodology. It is considered to be particularly robust in that the abilities and skills are reported objectively according to level and importance, with abilities having 52 separate items which are scored for each occupation. Willison and Tsacoumis (2009) reported that the inter-rater agreement measurements were consistent for assessments of both level and importance (SD of .67, SEM .24 and SD of .52, SEM.18 respectively). It was also reported that for the Cycle 9 updates (in which IT occupations were included) that there was found to be acceptable inter-rater reliability across constructs within occupations and also across occupations within constructs (with some notable exceptions which

would not affect the use of the data for analysis of IT occupations). The use of this methodology thus allowed for a more detailed analysis of these occupational groups, than did the SOC particularly when considering the characteristics associated with knowledge work, particularly in comparison with the SOC. In light of this the occupational categories were therefore selected from O\*NET for use in the survey and the O\*NET data were then used to determine which of these IT occupations could then be most appropriately considered as archetypal knowledge work or non-knowledge work occupations. In order to determine this abilities, skills, knowledge and task related scores for each of the O\*NET categories were classified and compiled (termed by the researcher as knowledge work variables) according to the pertinent characteristics attributed to the knowledge worker archetypes derived from the literature review. After examining the data it was determined that the higher scores could be considered to be representative of knowledge worker roles and the lowest considered to be the least representative of knowledge workers and therefore be determined as non-knowledge workers within this occupational context. This is in line with the characteristics described in the literature and the subsequent archetypes established at the end of Chapter 2.

O*NET knowledge work variables	Software Engineer	Software Applications	Database Administrator	Network Administrator
Complex Problem Solving	96	91	63	66
Critical Thinking	90	96	63	69
Judgment and Decision making	65	83	56	66
Active learning	85	86	60	56
Investigative	100	95	72	83
Thinking Creatively	84	85	62	76

Table 3.1 O\*NET knowledge work variables

Table 3.1 evidences the distinctions between the scores for variables which were defined as features of knowledge work according to the literature showing the highest and lowest two scores. The O\*NET classification data ranks these scores out of 100 according to each occupation. Therefore, after applying this method, the knowledge worker occupational archetype was determined to be best represented by software developers (combining engineer and applications roles) and the non-knowledge worker archetype by database administrators or network administrators. Figure 3.1 presents the process of archetype development at this point of the research.

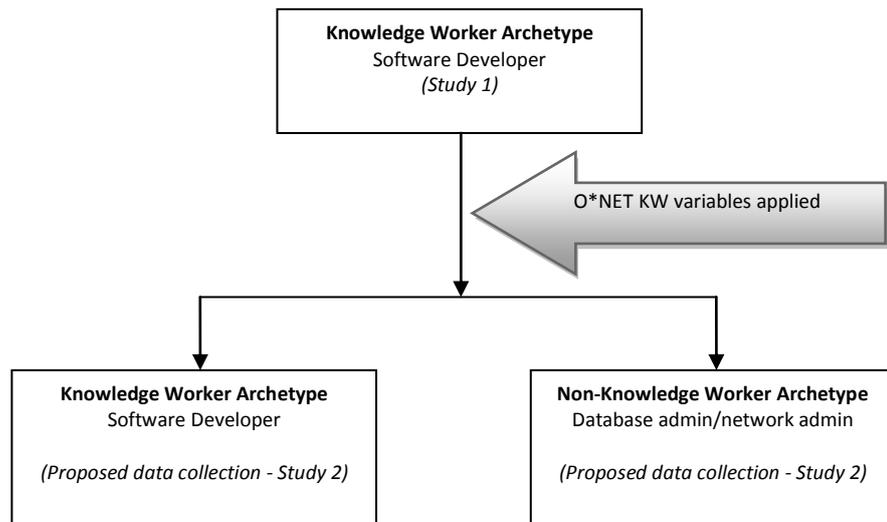


Figure 3.1 Archetype development

The occupational archetype vignettes derived from the application of occupational classification system are presented in Chapter 5 alongside the development of the theoretical framework and hypotheses. After the occupational classification data was used to determine the occupational archetypes the survey was developed to test the hypothesised relationships within the KWCM as follows.

### 3.33 Global Survey

The confirmation of key themes, the establishment of the model and hypotheses development were supported by a review of additional literature pertaining to the key variables. Chapter 5 details the key constructs and supports the methodological choices made in relation to Study 2, particularly with regards to the selection of the scales. In response to the findings from Study 1, Study 2 was designed to examine the model and hypotheses proposed in Chapter 4 by generating data which could be considered to be generalisable and broad, thereby contributing to the discussion of knowledge workers in the examination of the established occupational archetype.

#### 3.323 Measures

The variables detailed in Chapter 5 which make up the KWCM are the JCM variables, creativity, goal orientation, identification and commitment. The selection of the scales is detailed here with reference to the survey which can be seen in the ethical approval document which is included in Appendix 1.

### *3.331 Job Diagnostic Survey*

The Job Diagnostic survey is used to measure the variables which form the Job Characteristics Model (reported in Chapter 5). The variables are all scored using a seven point Likert scale with the exception of Job Choice Growth Need Strength which is measured using a five point scale (which is then converted for analysis by multiplying the scores by 1.5 so that the data is comparable). Each of the scales is anchored at 1 as being the low score and at 7 being the highest report. All of the computations relating to the scales and related variables are included in Appendix 1 and are used in this study. However, it should be noted that there has been some attention drawn to the calculation used for the Motivating Potential Score of the job (MPS) by Fried and Ferris (1987) and it is also mentioned in Appendix D of Job Redesign (Hackman and Oldham, 1980). The calculation is published as follows:  $[\text{Skill Variety} + \text{Task Identity} + \text{Task Significance}/3] \times \text{Autonomy} \times \text{Feedback from the Job} = \text{MPS}$ . However, it was suggested that this is overcomplicated as a purely additive calculation would be a better method, particularly due to the fact that these measures tend to intercorrelate. Whilst this is acknowledged as an issue, the current study continues to use the original calculation so that the results can be compared with other available norm data as necessary.

### *3.332 Creativity*

Zhang and Bartol's (2010a and 2010b) scale is used to measure Creative Process Engagement. Creative process engagement is formed of problem identification, information searching and ideas generation. This was found to be appropriate as a measure as it included the components which were specifically related to creativity and problems solving as a process derived from Amabile's (1993) componential framework. This is an eleven item scale (3 items measuring problem identification, 3 measuring information searching and 5 measuring idea generation) which uses a Likert scale with five points measuring responses ranging from 'never' to 'frequently'. The respondents are asked to answer the question "In your job, to what extent do you engage in the following actions when seeking to accomplish an assignment or solve a problem?" Zhang and Bartol's scales were independently reviewed in order to establish the validity of the items in being attributed to appropriate dimensions of Problem Identification, Information Searching and Encoding and Idea Generation (reported  $\alpha$ 's = .77, .77 and .81). This scale allows creativity to be measured by self-report rather than by an objective rater. Due to the type of study being conducted this measure was considered to be most appropriate as an objective, third party measure of creative outcome could not be obtained for this sample. In Zhang and Bartol's study there was a strong correlation of

CPE to creativity ( $r = .70^{**}$ ) and results also showed that CPE was positively related to creativity as a moderating variable ( $\beta = .55, p < .05$ ).

### *3.333 Goal Orientation*

The literature in Chapter 5 details the development of the theory of goal orientation. In order to measure this construct Vandewalle's (Vandewalle and Cummings, 1997) scale was selected which measures the three components of goal orientation: learning, prove and avoid orientations. The scale comprises of 13 items, 5 measuring learning goal orientation, 4 measuring prove goal orientation and 4 measuring avoid goal orientation. The scale is anchored at 1 – strongly agree and 6 – strongly disagree with no reverse scored items. After substantial testing the internal consistency is reported as learning orientation  $\alpha = .89$ , prove orientation  $\alpha = .85$  and avoid  $\alpha = .88$ . Test- re-test reliability was reported as having a correlation of over .40 when tested over a minimum three month period (Vandewalle and Cummings, 1997).

### *3.334 Identification*

In order to measure identification in terms of the concept identified in Chapter 5 two scales have been selected. The first is using Van Dick et al (2004)'s scale which measured four foci of Organisation Identification in the teaching profession (career, team, school and occupation) for cognitive, affective and behavioural identification. The respondents are asked to use a 6 point Likert scale anchored at 1 (is not at all true) and 6 (is totally true for myself) for each of the questions, in relation to each of the foci. All scales were reported by Van Dick et al (2004) to have good reliabilities with a CFA having determined that the foci can be considered as being distinct along with the four dimensions of identification. Shamir and Kark's (2010) single item graphic scale takes a similar approach in that four foci are used and respondents are asked to choose from the 7 graphics as to which one most adequately represents the extent to which they identify with the foci. This scale was tested against a range of validated verbal scales and it was found to have convergent and concurrent validity. Therefore the scale was considered to be a useful addition to the survey in that it sought to reduce the possibility of common method variance at the end of a substantially long survey and that it would support the Van Dick et al (2004) measure.

The loci of identification were selected as the organisation, the team, the profession and community. The latter was contextualised for the respondent within the survey by asking whether they perceived themselves to be part of a community (for example PHP developer community, Oracle Forums etc) and they were asked for a description of this prior to using the scale. The term profession was chosen here to represent the respondent's identification with their occupation as it was felt to be a

term less directly associated with their role and consequently their organisation. It was also felt to adequately represent the occupation in abstract terms suggesting membership rather than conceptualising it as an agglomeration of tasks and roles which 'occupation' may be comprised of. It should be noted that IT work would not be termed a 'profession' according to many defining characteristics measured by Hickson and Thomas (1969) but the 'new' view of professional work would support its use (von Glinow, 1988)

### *3.335 Commitment*

The three component model of commitment (Meyer and Allen, 1997) was considered to be a robust and appropriate model to use given that it is a well-used scale which has received much testing. The scale measures affective commitment, continuance commitment and normative commitment. The scale used in this study was the revised version (Meyer et al, 1993) comprising of 6 items for each of the separate components, totalling 18 items. The scale is a Likert Scale anchored at 1- strongly agree and 7 – strongly disagree. It should be noted that in this study, due to researcher error, the scale was reversed (including the reverse score items) and this should be noted when interpreting data presented in Chapter 7. Reliability estimates generally exceed .70 for the whole scale and median reliabilities are stated as .85 for affective commitment, .79 for continuance commitment and .73 for normative commitment (Meyer and Allen, 1997).

### *3.336 Sample Selection*

This study draws from the global population of IT workers in order to establish a sufficiently large and representative sample of the various occupational groups and to avoid national bias within the sample. There is no requirement to sample from within a specific organisational context for this study as the focus is upon the work and perceptions of their employing organisations reported by the individuals. It is acknowledged that objective measures which may be useful in determining particular aspects of the job, such as creativity cannot be established but this does not affect the testing of the model and hypotheses within this study.

### *3.337 Survey distribution*

An opportunity sampling approach was taken using an open invitation which directed respondents to [www.knowledgeworkers.co.uk](http://www.knowledgeworkers.co.uk) (where the Survey Monkey link was embedded). This was initiated by a number of emails being sent out to request that the invitation to participate in the survey be publicised using the recipients network. The type of media used to invite participation differed depending upon the individual or organisation contacted. It was publicised via a google+ account, Twitter (including the researcher's own account), email, the British Computing Society (BCS) regional

email newsletter. The main sources of interest in the survey were created through the publicity generated by Joel Spolsky publicising the Knowledge Worker Survey and also the BCS newsletter. Joel Spolsky's endorsement of the project was significant in attracting responses as he is a prominent figure (some might use the term 'guru') within the software development sphere. Based in New York he is the founder of Fog Creek Software, Stack Overflow website (stackoverflow.com), Joel on Software blog and author of several books with over 60000 Twitter followers. A number of UK and US professional associations were also contacted but there was no interest generated there other than through a personal contact of the researcher at the regional East Midlands BCS branch who included the initiation in the branch newsletter. There were other responses to the survey which were generated through email using the researcher's own personal networks and in turn, through the contacts own networks. In essence, the majority of the sample emanated from the invitation being publicised by Joel Spolsky. The sample could be said to be representative of the IT worker population who use the Internet, (specifically development sites) to obtain current information and comment on software development. Within any other worker population this may be considered to render the sample representative of a particular niche who prefer to use the web as an information source. In this instance it is a significant proportion of the IT workforce that use the Internet as a regular information source, or tool, in conducting their work. Stack Overflow, for example, is widely known of and used by IT workers for technical advice and for updating knowledge about the work domain.

### 3.34 Cluster analysis to refine the occupational archetype

Chapter 6 details the refinement of the archetypes using the O\*NET classification system and an extended set of knowledge worker variables derived from the literature and Study 1. After the survey data had been collected the occupational sample was reassessed prompted by the limited responses received from the non-knowledge worker archetype group. The non-knowledge worker archetype had been established to serve as a counterpoint (a dyadic opposition in line within many of the models presented in Chapter 2) in further understanding archetypal knowledge workers, their perceptions of work and their relationships with organisations. In order to address this issue the occupational data was regrouped in order to re-aggregate the sample and determine alternative non-knowledge work occupations. It was determined that a more refined method of achieving this would be through the use of a cluster analysis, the aforementioned job classification data (O\*NET) and an extended list of knowledge work variables. Cluster analysis seeks to group objects together based on their proximity to one another via a similarity measure calculated for pairs of objects (Moutinho, 2011). The technique chosen was the average linkage technique which, rather than using the extreme scores to establish links, uses the average of all of the variables within a cluster. It is

considered to be useful in that it is less affected by outliers than other methods. The distance measures used in this case are the squared Euclidean distances which were calculated before agglomeration of the clusters.

The results of the cluster analysis and the details of the refinement of the knowledge worker archetype are detailed in Chapter 6. These results demonstrated that there was significant difference within the occupational category of software development between subcategories of developers as programmers and web developers. This suggested that there was greater need for analysis at the level of the job and therefore the knowledge work archetype was refined, or further granulated to establish two knowledge worker archetypes. The pattern of archetype specification and selection methods applied through this is detailed in Figure 3.2 as follows:

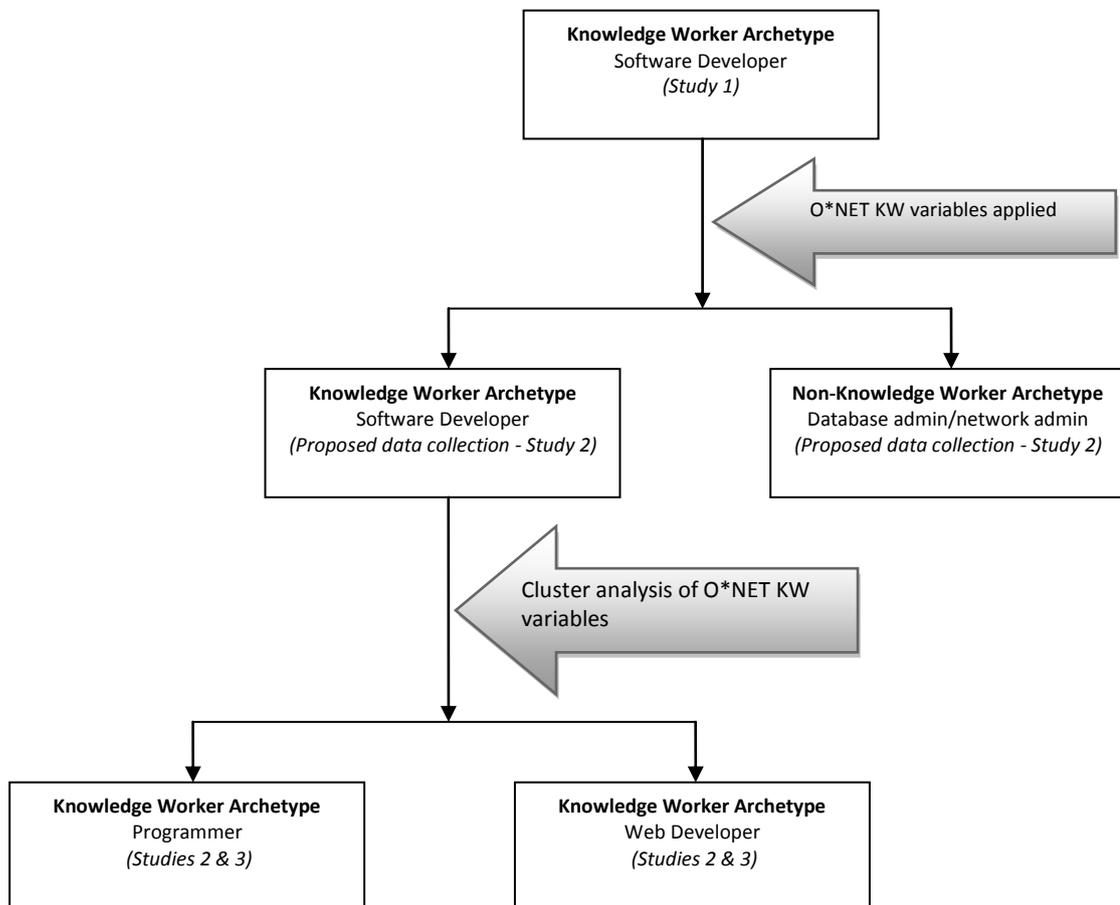


Fig 3.2 Revised Archetype Development

At this point the study is significantly altered in relation to its intended path in relation to the theoretical model, testing of the hypotheses and the use of the non-knowledge worker archetype as

a counterpoint to that of the knowledge worker archetype. With this refinement of the archetypes to programmers and web developers a review of the theoretical framework and hypotheses was conducted with supporting literature relating to the occupations. The theoretical framework and hypotheses were therefore adjusted to reflect the refinement of the knowledge worker archetype (presented in brief in Appendix 2). There was no longer a non-knowledge worker archetype to offer contrast and definition to the knowledge worker archetype. Therefore the differentiation in the occupational archetype groups provided the focus for discussion as to the nature of work and workers perceptions in the post-industrial economy in line with the reconceptualised framework and hypotheses detailed in Chapter 6. The survey data was therefore analysed in relation to these revisions as detailed in the following section.

### 3.35 Data Analysis

Data were imported into SPSS (version 19) from Survey Monkey and screened for errors and outliers. Anomalous scores and missing cases were coded appropriately. A total of 521 responses to the survey were received of which 237 were fully completed. As there were varying degrees of attrition throughout the survey any responses which contained missing data were excluded from the analysis pairwise, rather than excluding all cases where the survey was not fully completed. This was done so as to maximise the amount of useable data in the analysis. Therefore, in the results reported in Chapter 7 the number of cases varies according to the variables being analysed. Pearson correlation coefficient calculations were run for all of the variables in the survey (see appendices 3 and 4). This allowed for a broad analysis of the data and to check that there were no anomalies. This test enabled the researcher to identify that the two Identification scales were reporting similar internal correlation scores. Therefore, the Van Dick scale was removed from the analyses as the image-based scale of Shamir and Kark (2010) was felt to be less likely to attract criticisms related to common method variance. In order to address the different requirements of the hypotheses, three tests were applied to the data. T-tests were used to analyse the difference between the groups. Regression analyses were used to calculate the amount of variance that could be accounted for in the outcome variables and multiple regression analyses were used to test for moderation.

The data were screened prior to analysis whereby the data set was split into two groups according to the archetypes and each group was examined for normality of distribution, skew and kurtosis for each of the variables. Tests were applied as appropriate throughout the forthcoming analyses as appropriate to assess homogeneity of variance. Due to the number of a priori comparisons in the research design there may be a risk of Type I error occurring. However, this risk was mitigated by using appropriately selected and adequately powerful tests in the analysis. It is acknowledged that,

in attempting to address this issue of incorrectly detecting difference between the groups where there is none that the tests may lead one to believe the converse to be true (Type 2 error). In order to reduce the likelihood of error the tests have been chosen because they are sufficiently powerful and the sample is sufficiently large to be able to reduce the likelihood of error. It should be stated however that, whilst the sample at its highest is over the suggested 100 cases (Stevens, 1996) for both groups, at its lowest the web developer group falls below the recommended sample size. (Due to the sample size Mann–Witney tests were also run which corroborated the t-test results for the sample). All of the data met the assumption of equal variances using Levene’s test, in that the values were all found to be greater than 0.05, and were thus analysed accordingly using the two tailed significance data. As part of the regression analysis the results were screened so that outliers were suitably accounted for and in order to assess that there was no multicollinearity. The results for the multiple regression analyses demonstrated that there was no multicollinearity evident from the correlation coefficients or from the collinearity statistics for any of the analyses. The probability plots and the scatter plots all showed normal distributions. The casewise diagnostics indicated in some instances that there were outliers which required investigation, and in each of these cases the use of Cook’s distance found there to be no effect, given that none of the cases had a value of more than 1. The findings and analysis for Study 2 are presented in detail in Chapter 7 initially with an analysis of the whole sample to provide context before reporting upon the findings relating to the knowledge worker archetypes of programmers and web developers.

### 3.36 Study 3

Study 3 develops the findings from Study 2 in examining and developing the key themes. It focuses upon deepening knowledge relating to objectives 1 and 2 and upon data collection relating to objective 3 in order that objective 4 might be addressed as a result. This study was designed as part of the multi-method approach stated at the beginning of this chapter in order to collect rich, qualitative data which builds upon the quantitative study findings. The study uses a similar method of data collection and analysis to Study 1 by using semi-structured interviews. However, it differed in that these interviews were conducted using Skype with respondents from different countries, enabling the data to be recorded and analysed as in Study 1. The method of analysis was the same as in Study 1 using an interpretative thematic approach. This study is detailed within the following section.

#### *3.361 Semi-structured interviews*

The respondents to the Knowledge Worker Survey reported in Chapter 7 were asked if they wished to be interviewed as part of the research study. From 521 responses 117 supplied their contact

details and their responses were assigned to programmer and web developer groups. Emails were subsequently sent explaining the next phase of the research and inviting them to participate via Skype. Details were given as to the nature of the interview, use of Skype, confidentiality and the length of the interview. The invitation received twenty two responses from around the world with ten responses from web developers, nine from programmers and three from managers. However, the manager responses were not used within this data analysis as the data were largely extended career accounts. Also, the low number of responses meant that it was difficult to establish any patterns within the data. It should be noted that this was achieved by sending the invitations out in batches until the required number was reached. This sampling method clearly affects the types of participants engaged in the study as they have self-selected, by virtue of both their original response and their willingness to participate in the interview, thus no selection was made by the researcher.

The interviews were conducted using a semi-structured approach with themes determined from the variables used in the theoretical framework and the analysis of Study 2. The themes detailed on the schedule were all covered in each of the interviews but were not addressed in any particular order. Therefore the structure was relatively loose and allowed the subjects the freedom to talk at length, if they wished to, about particular issues. The researcher then chose to take the questioning wherever was felt to be most appropriate given the subject's response. All of the interviews were conducted in the same way, with the same themes used for both the programmer groups and the web developer groups. The issues covered in the interviews rarely drifted far from the items on the schedule. However, at times, clarification was sought regarding phrases which were unfamiliar to the researcher. Themes which emerged, which were not a part of the original schedule, were those regarding the differences between backend and front end developers and I/T shaped workers. After these issues had emerged from one interview this themes was added to the schedule. Respondents were given the opportunity to add anything that they thought was relevant at the end of the interview and to ask questions of the researcher. The interview times were agreed according to availability dependent upon the time zones which the participants and the researcher resided in, with many conducted outside of working hours. The Skype calls were recorded using Pamela video call recording software so that the interviews could be thoroughly analysed through transcription of the calls. All of the interviewees were sent consent forms via email (see appendix 1) explaining the nature of the research, which were signed and returned digitally to the researcher before the commencement of each of the interviews.

### 3.3611 Web based interviewing

The use of semi-structured interviews is a well-used data collection method which has been examined in detail in relation to research design and methodology pertaining to Study 1 in Chapter 3. However, the use of virtual synchronous interviewing is relatively new in that it has only recently been possible to use Skype (and other Internet-based video call packages) to communicate in this way globally as a legitimate substitute for a telephone conversation, due to advances in both the software and also the improved infrastructure allowing increased bandwidth. That is not to say that the use of this technology enables a flawless conversation without intermittent technological problems but it is to say that it can be used effectively to conduct an interview as one would in person. It also has the benefits of being able to record the conversation inconspicuously through the software and also being able to conduct face-to-face discussions internationally. In contrast to the research conducted in Study 1 (using an audio recorder in a meeting room within the organisation) these interviews can be undertaken wherever the subject and the researcher choose, that is, wherever they have access to webcams and Skype. In the case of one subject in San Francisco this was using his mobile phone on a couch at home, for others the interviews took place in their home offices, in kitchens or wherever was most convenient for them. This brings to bear a set of different circumstances upon the interview that have rarely been experienced to date in that both research and subject are able to conduct the interview in settings which are most amenable and appropriate for them. It could be suggested that these research interviews may be perceived by the subjects as being highly informal and it therefore gives the subjects a greater sense of ease in that they are in their own surroundings. This allows the subjects to conduct the interview in an environment that is most conducive to them being open and honest without the physical disturbances, or indeed the psychological disturbances that may come from being in an organisational environment when the interview is conducted. From the researchers perspective the sense of entering the subjects' own domain was felt to be a little incongruous at first in that the researcher's experience with this technology has been either in a formal, business setting (teleconferencing) which is in an organisational context or with distant friends where personal relationships are already established. It quickly became apparent that the majority of the subjects were perfectly at ease with the technology and use it frequently to communicate as part of their 'virtual' working habits. From the researcher's own experience and prior observations the subjects appeared to be more quickly at ease than when research interviews have previously been conducted either face-to-face in organisations or in subjects' own homes. It may be this fact that led to the proposed 30 minute interviews more often becoming 45 minutes to an hour long as the respondents were more loquacious than the researcher anticipated they would be. However, this may also be connected to

the limitations of the technology in that there was a slight time delay which meant that interjection and quick questioning was a little difficult and this may have generated more space for the subject to talk than in a temporal rather than virtual conversation.

Whilst there were many perceived benefits to the use of this technique there were a number of issues related to the call recording software, which was not particularly robust, and also situations where calls dropped out due to low bandwidth etc. Aside from these technological interruptions the only other diversions came from the subjects' own direct environments where children, pets, phone calls, parcel deliveries and drink breaks punctuated the discussions. These interruptions did not feel as though they generated a stilted and disjointed discussion, rather they generated a sense that the researcher was a genuinely welcomed guest into the subjects' environment for that portion of time with a discussion which flowed as easily as it would within a face to face interview, if not more easily. Whilst there is some research related to the use of Internet based research techniques (Mann and Stewart, 2001; Mann and Stewart, 2002; Reid, 1995) there is little literature pertaining to this type of interviewing method and its relative (de)merits as it has only recently become feasible to use. It could also be suggested that this particular occupational group are the most likely to have access to and be comfortable with using this technology. Therefore, the experiences generated within this study may not necessarily be replicated elsewhere to quite the same degree in terms of the level of acceptance of the technology or readiness to engage with it as an accepted and 'normal' method of communication.

### 3.3612 Data Analysis

Analyses of the interview data was undertaken in a similar fashion to Study 1 in accordance with the research objectives, hypotheses and the questions which arose from Study 2. A combination of *a priori* and *a posteriori* coding was used to analyse the data, using codes derived from Study 1 and codes developed throughout the analysis. As with Study 1, a broad interpretive analysis was undertaken which sought to explore the research themes in greater depth. The approach taken to the data analysis here was again using ITA, which is a systematic approach to identifying key themes within the data which recognises the active role of the researcher with the analysis process (Braun and Clarke, 1996) where themes capture meanings, as patterned responses, within the data set. In this case themes were *a priori* coded and as sub-themes emerged they were added to the thematic map and given an associated code. The data from this study is presented in Chapters 8 and 9 with the former focusing upon the testing of the hypotheses in relation to the KWCM (objectives 1 and 2) and the latter focusing upon emerging themes and themes relating to people management practices (objectives 3 and 4).

### 3.4 Conclusion

This chapter provides details of the research methodology presenting the research as a product of the researcher's post-positivist position, taking the pragmatic perspective of the bricoleur. It presents the research design in relation to this philosophy, the research questions and the objectives stated in the introduction to this thesis (Chapter1). The research design presents methodologies for each of the three phases of research. The initial phase of any research is to review the literature and to define the contribution to knowledge that can be made. This programme of research responds to the call to examine work and workers in the post-industrial context where much work has focused upon organisations and organising for work. The existing contribution was determined to be made using the terms knowledge work and knowledge worker and the literature review (Chapter 2) identified that there were a number of questions which could be asked relating to these workers, particularly in relation to people management practices and perceptions of the work undertaken. The IT sector was determined to be an appropriate domain for the programme of research in that the literature consistently maintained that this was a sector which had emerged in line with the post-industrial economy and was frequently used in order to study knowledge workers. Similarly software developers were considered to be representative as they were consistently presented as such in the extant literature.

After establishing software developers as the unit of analysis an exploratory study was considered to be an appropriate method of exploring the key themes emerging from the literature. Study 1 was designed to build upon these themes by using an exploratory case study within a KIF context. This was conducted within a small software house using semi-structured interviews using an interpretive thematic analysis to identify key variables to form the foundation of the theoretical framework. Prior to the development of the theoretical framework the occupational archetypes, as the units of analysis, were refined. Details of the use of the occupational classification data are presented in this chapter. A number of knowledge work variables were established from the literature and from the classification data which were used to establish scores which identified software developer as an archetypal knowledge work occupation (thereby confirming the inclination towards this group in the extant literature and supporting its use in Study 1). The lowest scores determined database/network administrators to have the least knowledge work characteristics and therefore were considered in this case as non-knowledge worker archetypes. After the archetypes were determined as the focus for the quantitative study the theoretical framework was then developed alongside the hypotheses (detailed in Chapter 5). This provided the key variables for Study 2, derived from the knowledge

worker characteristics presented in Chapter 2 and from Study 1 (Chapter 3). The related scales selected from the literature presented in Chapter 5 are detailed in this chapter.

The next phase of the methodology is detailed in the reapplication of the occupational classification method. After the global survey was concluded the data was found to be insufficient for use of the non-knowledge worker occupational archetypes as database/network administrators. Therefore a cluster analysis was used to review the knowledge worker variables against the occupational types. This led to the refinement of the archetypes concluding that there was a substantial difference between programmers and web developers who could broadly be termed software developers. The new archetypes were therefore established and the results and refinement of the theoretical framework are presented in Chapter 6 with new hypotheses established to interrogate the KWCM in relation to the knowledge worker archetypes. This methodology chapter gives details of the statistical analysis methods used in relation to the Global survey of Study 2, with the results presented in Chapter 7. Study 3 was designed to develop a richer, more detailed exploration of the findings in Study 2, particularly in relation to objective 3, using interview data from subjects who had shown interest in participating when completing the survey. Details of the collection and analysis methods used are presented in this chapter and are similar to those used in Study 2 other than the use of Skype to interview the subjects. The use of Skype raised some interesting issues which are detailed in this chapter regarding the quality of the data as both the interviewer and the subject are participating within their own environments.

This chapter presents the researchers' philosophy, the research design, use of occupation classification in the development of the archetypes and the methods of collection and analysis for each of the empirical research studies. This methodology demonstrates the researcher's bricoleur approach to designing a programme of research where each study builds upon the last, using mixed methods to generate both breadth and depth in the data collection and analysis. It draws upon both positivist and interpretivist approaches in line with a post-positivist philosophy, acknowledging the pragmatic merits that each of these positions have to offer in combining to meet the research objectives for the thesis. After detailing these methods the thesis now moves to the results of the exploratory case study (Chapter 4) where the key themes from Chapter 2 are explored and refined in order to develop the theoretical framework and hypotheses presented in Chapter 5.

## Chapter 4 Exploratory Study Results

### 4.1 Introduction

The archetypes of knowledge workers (and the contrasting archetype of non-knowledge workers) were established through a review of the literature in Chapter 2 as the unit of analysis for the research programme in order to respond to the research questions and objectives. As detailed in Chapter 3 the first phase of the empirical work is designed to explore the key variables and to establish a conceptual framework for further study of knowledge workers. This exploratory, single organisation case study focuses upon knowledge workers as software developers working in a software development firm and analyses the way that they perceive their work, occupation and their employing organisation. It also examines their responses to HRM and people management practices. Details of the design and methods used in relation to this study were detailed in Chapter 3 and this Chapter presents thematically the results of the study.

### 4.2 Results

After the interviews were transcribed, codes were assigned to the key themes which emerged directly from questions related to knowledge work characteristics in the literature, additional themes were coded accordingly and further analyses undertaken. The results from the designers and the financial controller are not included in this discussion as the content was not generally relevant other than to establish a broad understanding of the organisational setting. The interviewee details are included in Table 4.1 below:

ID	Role	Employment Type	Highest Qualification
WD1	Web Developer	Permanent	BSc Information Systems
WD2	Web Developer	Permanent	MSc IT
WD3	Web Developer	Permanent	HNC Software Engineering
SDC1	Software Development	Contractor	HND Business and Finance
SDC2	Software Development	Contractor	BA Politics and Sociology
AP	Analyst Programmer	Permanent	MSc Computer Studies
SDP	Software Developer	Permanent	BA LLB
SD	Software Developer	Permanent	BSc Software Engineering
CM	Commercial Manager	Permanent	CIMA

Table 4.1 Table of Interview Subjects

It should be acknowledged that at times the themes merged into one another but for the sake of clarity the findings are discussed thematically below.

#### 4.21 Creativity and Problem Solving

Creativity and problem solving are prominent themes within the knowledge work literature. As this appears to be a common thread, and one which appears to be a key definitional feature of the rhetoric, it is assessed first. As with knowledge work itself there are issues around the definition of creativity and problem solving as these terms are often used interchangeably or the concepts themselves conflated. When asked about whether they considered themselves to be creative the software developers in the organisation generally answered in the affirmative as follows:

WD1: Yeah...maybe, maybe in terms of what I do in my job yeah – I’m not artistic but...yeah
WD3: Yes....because I do a lot of stuff because I can – not because I need to, or, not even because I can , erm...because I want to ...I do a lot of things because I want to without actually having a need to do them. –
SDC 2: within limits yeah – creative...everything that can be done with the brain but not with the hands (laughs)
SDP: Erm...I am in a development sense...
AP1: Within it I’m just happy programming – that’s creative. I like being creative and I’m happy doing that. I have no aspirations to become a project manager or anything like that
SDP: ...you have to be a logical thinker. Have the ability to solve problems and ask for help if you’re not sure.

Given the responses in the above excerpts it is apparent that creativity is also linked with the freedom to be creative, that is, latitude in decision making regarding technologies and solutions and autonomy within the role to control the work. In considering the response of WD3 where creative activity may go beyond the scope of what is required to complete their work there may be a conflict in meeting the organisational targets for production and creative freedom. Employees having freedom to be creative out of interest, rather than necessity, may be problematic to organisations and may be symptomatic of organisations where managers do not necessarily understand software development work. In some cases the responses to the question were very direct and lacked much elaboration, with the subjects merely affirming that they thought they were creative. With AP1 there was a clear recognition that programming was creative, albeit it a different kind of creative from that which might be imagined from an artistic perspective. That said, the technical aspects of the work are, by SDC1, likened to the creativity which might be described by a writer or musician describing intrinsic beauty in the product and the creative process:

SDC1: Taken down to its pure level the actual logic of code I find well....stimulating – my first word - there's a sort of a beauty to completely logical...if you do this, this happens type thing and that's very, very stimulating.

Despite the rather succinct answers given by many of the developers with regards to creativity there was evidence in the transcripts of frequent reference to problem solving which pervaded responses to other questions. For example, this respondent attempted to examine the nature of the role and described it largely in terms of problem solving:

WD3: I always think IT's a different thing – well it's problem solving and it's facilitating, it's a bit like, it's a bit like...just trying to think of a good way of putting it...you provide the glue for everyone else to do what they've got to do and it's a neutral thing really – it's not like kind of a...we're not going in there and making up these ideas for people they've got those ideas already and we're solving – we're helping them to solve their problems...

As within the knowledge work literature, creativity and problem solving are treated as separate constructs. Frenkel et al (1995) use creativity as one of the variables in determining their ideal types of worker. Software development work, according to the interview responses would undoubtedly be located in the top right corner of the cube (see Fig 2.2) suggesting high creativity, high theoretical knowledge and high intellectual skills and therefore the term knowledge worker would be applied to this group. The response from SDC2 'creative - everything that can be done with the brain but not with the hands' encapsulates much of the early comments regarding knowledge work from Drucker in the context of software development work. Moving away from the notion of creativity towards complex problem solving, the EIU (1998) model (see Fig 2.4) would similarly, according to the responses in this study, locate software developers at the far right of the complexity continuum. According to this model, complex work is considered to be evident in unstructured problems which have imprecise information inputs and diffuse or general scope which are evident in WD2's response below.

WD2: It's a different kind of ethos to er...the kind of jobs where it's like when I was a student and I'd go and work in a kitchen for a couple of days and just wash pots and pans and they'd say 'here are some pots and pans – wash them' and I'd wash them. Whereas if you're given a job as a professional I'd be told to fix something or er...design something, or develop something or whatever and you're not necessarily told exactly how to do it because you've got...you should have the problem solving skills to be able to solve that problem and then if you haven't then you have the kind of...the attitude to actually approach it and solve the problem somehow and get help to solve the problem or whatever – you know. Whereas if you're just told to clean something or hammer that's a very simple kind of thing.

This response epitomises the knowledge worker discussion around the content of the job in terms of application of knowledge, problem solving, the amount of autonomy that there is in the role and the level of ambiguity that is inherent both within the work and the employment relationship. Evidently, from the analysis of the interview data, the presence or absence of creativity, problem solving and complexity in the work is of considerable import in determining the level of job satisfaction experienced and any associated affective behaviours. It is therefore essential that this facet of the work is explored in greater detail within Study 2 in order to establish the extent to which problem solving and creativity impact upon these outcomes. Its inclusion in the theoretical framework will also require a fuller review of pertinent literature relating to problem solving and creativity in order to explore what is meant specifically by these terms and thus determine what is most appropriate to measure.

#### 4.22 Autonomy

In addition to creativity and problem solving, autonomy is frequently cited in the literature as being a prominent characteristic of knowledge work. The interviewees were asked specifically about the level of autonomy that they felt that they had in their work. AP below indicates that autonomy is present in the work, which is apparently only constrained by the deadlines which need to be met, the 'how you do it, the way you do it and the when...' is at the developer's own discretion.

AP: So as soon as you're assigned a project then you're autonomous as long as you get that done by a certain time it's up to you how you do it and the way you do and when you do it. As long as it's done by a certain date the company will leave you alone basically.

This was echoed in WD2's response which demonstrates that the autonomy is also synonymous for this worker with independence and using one's own initiative.

WD2: ...you have to be more independent in terms of the way that you approach things – you have to work with initiative in your own right....

Similarly SD2 identifies the importance of decision making in the role and the importance of this to autonomy:

SD2:...as I said it's important that software developers can make decisions and most of the time they can make such decisions so it has a degree of autonomy

The overlap between autonomy, decision-making, and independence is generally evident in the responses to this question and it is apparent that this facet of the work is linked to the freedom to tackle the problems which are at the core of development work. Freedom to make decisions is thus

perceived as being an important facet of autonomy for developers but there is some disagreement as to the extent to which this is always a positive experience. WD3 identifies that autonomy, if taken to the extreme can be potentially detrimental as it manifests itself in lack of accountability:

Interviewer: Okay. Do you feel that you have autonomy in what you do?

WD3: Yes. Maybe too much.

Interviewer: What makes you say that?

WD3: My work is never reviewed by anybody. No one really looks at it. If it broadly works then that's just accepted, when really someone should look at it and go that's really not very clever (sniggers) or if you'd done it like this then you could have done it in half the time or...there's no accountability – it's only if things are taking too long or if things just don't work at all that you ever get other people involved.

The perception that autonomy can be detrimental to high quality work and accountability is also associated with the extent to which an individual identifies themselves as being part of a team. Autonomy is directly perceived by one developer as being part of the way in which the development role is played out, at a team rather than at an individual level, and reflects the need for interdependence in the work. WD2 also articulates this as being implicit in the way that an individual's opinions and expertise are respected:

Interviewer: And do you feel that you are given autonomy? Do you think it's an autonomous job?

WD2: It can be. It can be. There are different levels of autonomy though erm...and I think sometimes it's not so much the fact of whether you're given autonomy or not it's more to do with the way that you're respected for your opinions or your convictions about particular things. So if you're working within a team it's not really autonomous – you have to work within a team, you have to work with other people but if you raise a particular kind of question about something rather than being told what to do you have a discussion and you reason out something.

For WD2 the level of expertise and knowledge which is resident in the individual is highly integrated into team decision making. This view links to the EIU (1998) model in that level of interdependence is used as a method of classifying the work. High levels of interdependence would, along with high levels of complexity, suggest that development work is congruent with the Network model in the EIU models of work. This network model is described as being improvisational work which relies on deep expertise (see Fig 2.5) suggesting that the characteristics described with the data reflect those which represent knowledge work in this model. The importance of identification with the team and the level of interdependence is, when considering knowledge work as explicated in the EIU model and in the results of this study, an important factor for further analysis.

#### 4.23 Occupational identification

The notion of the difference or uniqueness of software development work was expressed by some of the respondents which suggests a strong sense of identification with the occupation. This was a theme which emerged as the data was analysed by the researcher as it hadn't been detected within the literature review as a characteristic unique to knowledge work. (It should be stated that at the time of this research the work of Swart and Kinnie (2004) had not been discovered by the researcher which discusses issues of identification in relation to HR practices within a cross-occupational sample of professional knowledge workers). It appeared therefore, given the allusion made to team identification earlier, that further analysis of this may give greater insight into the way in which they perceive themselves. None of these workers were members of any professional association such as the British Computer Society (BCS), yet all of them considered themselves, when specifically questioned on it, to be professionals. The sense that this role is somehow difficult for others to understand contributes to the sense that it is highly specialised and that there are only certain people who are able to do it. SDP recounts an occasion when this uniqueness and specialism was demonstrated:

SDP: Well I think that it's something that's a very specialist field erm...if you talk to laymen about terms that we would use here, that a professional developer would use – they wouldn't know what you were talking about..I experienced that yesterday when I was on the bus home talking to my cousin's friend and I said 'I'm a web developer' and they said 'oh that means nothing to us'...it's a very specialised field.

Similarly, the feeling that only 'certain types' of people are imbued with the right set of characteristics and skills is articulated by SDC1:

SDC1: Erm....it's a skilled job, not everybody can do it. It's a very...everyone thinks they can do it or thinks they'll have go but I think there's a very...certain type of person type of person that can do it and a certain amount of knowledge you need erm and awareness and cleverness to a degree.

Here, SDC1 identifies more specifically a number of features of software developers including, knowledge, awareness, cleverness, skill and these contribute to the stereotypical software developer which is the locus of identification for this individual. Aside from the issue of identification, the additional characteristics ascribed to developers from within this sample, which contribute to this stereotype should also be examined further.

<p>Interviewer: What do you think are the key characteristics of software developers then?  SD: Geeks – you’ve not heard that one before have you (laughs)...usually intelligent...and the good ones are structured and logical...er...like to keep abreast of new technology</p>
<p>SDC2: Yeah...as I say it’s logical thinking, it’s perseverance – perseverance in getting information on one side and to apply this information until you get the result you need. Erm...an analytical mind – if you don’t have it’s very difficult to erm...de-bug programmes, to get the programme flaws out of it because you won’t see it</p>
<p>Interviewer: What do you think is the importance of knowledge in this particular occupation?  WD1: It’s the core thing...I would say it’s fifty percent, it’s at least fifty percent of everything in this job. The other fifty percent are intelligence, logical thinking, perseverance but you didn’t ask me that (laughs)</p>
<p>Interviewer:...what is it about a person that makes them a good programmer or a good developer?  SDC1: Erm...logical, to a degree; persistent, not give up easily; not to be frightened of making mistakes I think is a very big one...erm...a degree of confidence in what they’re doing ...erm a lot of people try it once and then think ‘oh no, it didn’t work’ and run away...very sort of analytical skill needed = you need to be able to analyse the problem and work things out from it...and you know general sort of mathematical skills are needed.</p>

The above table shows four responses that illustrate the most prominent characteristics which the respondents ascribe to the occupation and to developers. Skills such as intelligence, logical thinking, analytical skills, problem solving skills and perseverance are most commonly cited within the interviews alongside other characteristics such as confidence and being structured in their work. Perseverance is frequently mentioned but is not seen within the literature as being a characteristic associated with knowledge work although it may be that it is seen as a characteristic which is joined with problem solving and analytical work. Expertise, cognitive skills, theoretical knowledge and analytical skills are representative of knowledge workers when surveying the literature and this gives further support as to why software development is deemed appropriate to empirically investigate further. These characteristics of knowledge workers, derived from the literature and this data analysis are used to determine appropriate archetypes of knowledge workers and non-knowledge workers using occupational classification before establishing the hypotheses in relation to the KWCM. In order to establish what aspects of their work had a significant impact upon attitudes and behaviours, questions relating to motivation, job satisfaction, reward and management were specifically asked. The responses also touched upon job challenge (Purcell et al, 2007; Swart, 2007; Horwitz et al, 2003) and sense of achievement and these are examined in more detail as follows.

#### 4.24 Motivation

The interviewees were asked about what it was that they found motivating about their work and from this there emerged a clear view that it most certainly was not the money. The data suggested that the developers consider themselves to be paid an adequate amount of money and therefore motivation was primarily derived from the content of the job (Tampoe, 1993). The response from

SDC1, who had expressed his desire to leave the company, demonstrates the lack of attachment to money and the need for challenge and interest to be the predominant motivators in his work:

SDC1: I don't know....part of my problem (laughs). They were asking me this when I said I want to leave. 'Well what motivates you - I don't really know' – not money, I'm quite happy I'll earn enough, I don't want particularly any more than that erm...I want to be interested in things; I want to do something that interests me that may be different tomorrow as it is today. So I want to feel interested in what I do. If I'm bored I will not do a good job; if I'm interested in it I will do a good job so...

Boredom was seen to be a significant factor in reducing the developer's level of performance and engagement with the work. The nature of the work itself, which refers back to the need for problem solving opportunities, is considered to be the primary motivator and the need for challenge was articulated by several of the other respondents. SDC2 was very specific in stating that a diverse array of challenges and projects was a specific motivator:

SDC2: What motivates me er...actually, challenges. Yeah and different, different kinds of challenges. I mean it's always like challenges in my whole life but in particular in IT, work in IT... I like different projects. There's nothing better than to have four or five projects to juggle with all of this.

Similarly, WD1 responded firstly by describing the role that the customer plays in motivation, both negatively and positively. This would not necessarily be the case for all developers but would depend on the level of interaction with customers which the role required. Web developers tend to interact more with customers in this company in order to scope out the project appropriately and to refine the design of the site as it is developed. Therefore, interaction with customers is likely to be more or less significant as an aspect of motivation dependent upon the role. After this aspect, WD1 states that it is a challenge in the technical problems which motivates him, underlining, once more, the motivational role which problem solving plays in development work.

WD1:...having aggressive, pushy customers is de-motivating for sure and if you've got a really good rapport with your customer you feel, you do feel more motivated to do a good job for them - you're prepared to put in a few extra hours for the...mm..What motivates me? It's just a challenge I suppose in the technical problems.

Further to this, personal responsibility and pride in the work are cited as motivators but this does not suggest that this is about working in isolation, as the individual's sense of responsibility to the wider team is mentioned as a motivator.

AP: Erm...responsibility, er...working individually on a project that I'm totally responsible for. They're the main motivational factors – yeah just because I sort of want to get it done – pride in my own work. And I suppose if, yeah if I've got to help colleagues out – yeah, assisting colleagues.

These reports of motivation are indicative of the fact that, in this organisation, developers are motivated primarily by challenge, problem solving and sense of personal responsibility for the work and as a member of the team. This does not necessarily suggest that their jobs are motivating as they were not asked to comment upon this, but this will be examined further in responses related to the management relationship and reward. Job satisfaction is closely linked to motivation and, at times within the interviews it appeared that the interviewees had difficulty in differentiating this from motivation. However, the results demonstrate consistency in the responses across the two themes.

#### 4.25 Job Satisfaction

As previously stated the theme of challenge and problem solving is a consistent one with it cited as being something which is linked to job satisfaction. These workers consistently support the notion that money, when paid at the appropriate level, merely eradicates dissatisfaction (Herzberg, 1959) as demonstrated by AP:

AP: I don't think that's so important actually I think it's just knowledge that you're doing a good job as long as you're not – as long as you're maintaining your salary and your conditions – as long as you get recognition that you're doing a good job and you're told that – you know: verbal assurances and praise then I think that's all you need and obviously financial bonuses are always nice but it's not essential.

Satisfaction is derived from the level of challenge and mental stimulation which the work provides to the developers. WD1 puts this emotively by speaking of the 'thrill of having a challenging problem'

WD1:...ultimately I come to work to get paid but I don't think I'm necessarily motivated by money on a day to day basis so erm job satisfaction erm...the thrill of having something...like a challenging problem I guess erm..that makes the job that bit more interesting.

Some of the sense of satisfaction was articulated as being derived from a 'sense of worth' to the organisation and ultimately to the customer. WD2 and SDP identified that achievement was important in creating a sense of satisfaction in the work. This implies that feedback on the work, both directly and from others, is important to feelings of achievement and value and consequently to an overall sense of satisfaction. Comments were also made as to the poor feedback mechanisms, particularly for developers who do not have direct contact from customers and who rely on the sales team to provide this.

WD2: it's a bit nebulous – it's a bit kind of that's – it's more of a sense of worth and a sense of sort of value erm...actually a feeling that you're achieving things and that you're advancing the ...you're having a positive role or a positive input into a business...

AP: Erm – Making customers happy. If you can tell that you've done something which they're really pleased with er.. it's got them out of a tight hole or it's done what they wanted exactly – if they're happy then you're happy. Good customer service.

The reaction from customers and satisfaction derived from this was dominant within the responses suggesting that recognition and customer feedback was highly important to developers. This was particularly with respect to a sense that the product was meaningful and served a useful purpose.

SDP: Erm...just putting something together and when it finally gets working when you finally code it and actually put it in use and the customer sees it and are pleased with it then I think that's really, really, satisfying that you know that lots of people are actually going to use as something that you've created

#### 4.26 Reward

Some similar issues were raised with respect to appreciation when questioned as to how they wish to be rewarded. Reward was generally treated as something which was intrinsic rather extrinsic. The developers in this organisation, with only one exception, consider reward in intrinsic terms rather than in extrinsic terms. SDC2 expresses that verbal recognition and knowledge of good performance is an extremely important reward.

SDC2: Of course everybody wants to be rewarded everybody wants to have somebody say 'this was well done it's a good job'

A quarterly bonus scheme was in existence which was linked to profit share and individual performance. Few of the developers recognised its existence and those that did expressed indifference and showed no sign of being motivated by it or of it affecting their performance in any way, either positively or negatively. SDC1's comments express the degree of indifference and the individual's preference for reward:

SDC1: I haven't heard it recently but it's always nice to know that what you do is appreciated. It's little things it's not if you do a good job you'll get a quarterly bonus, it's just simple things like just being told you did really good job makes a huge difference I think.

The sense that the scheme doesn't work due to lack of consultation and fundamental lack of understanding of the primary motivators of this group of workers is demonstrated in WD1's response below.

WD1: (Pause) How do I like to be rewarded? It's not something I've ever considered (Pause) See money is always good which, as I've said before is ultimately why I come here, but...here they try to use money as a motivator which hasn't worked. Recognition would be helpful if nothing else.  
Interviewer: Why hasn't it worked here that they've tried to use money as motivator?  
WD1: (Sighs) Erm...for one thing no-one was asked...I think they've just assumed that people would want it – I think I'd rather have more holiday, more than a bonus scheme.

This issue of reward is raised in Von Glinow (1988) and Horibe (1999) suggesting that it should be conceived of very differently for IT professionals and knowledge workers respectively in contrast to traditional professionals or non-knowledge workers. The empirical work reported in Chapter 2 by Horwitz et al (2003) suggests that motivation strategies are considered by senior leaders as being ranked third most effective after freedom to plan independently access to senior executives (it should be noted that this is perception rather than objective report). This would not be borne out in this study given the responses to the interviews, although the size of the organisation could be a factor in this difference, as could the fact that Horwitz et al (2003) report on a range of types of knowledge workers rather than developers specifically. The fact that WD1 thought that it was reasonable that they should be consulted on reward may be symptomatic of working in such a small environment but this could also be reflective of the individual negotiations of contracts and pay. The effectiveness of broad reward and performance management systems may be questioned when applied alongside individual contracts and pay negotiations as they may be largely ineffectual.

Interviewer: How easy do you think it is for people to manage developers?  
SDC1: They're difficult. They're not an easy breed of people to manage which probably is the other side of the problem and with someone who's managing who doesn't understand development therefore any question they ask can be easily bluffed and the developer can say that's six days when somebody who understood it more would say half a days work. He's got no way of understanding if that's right or wrong. Developers will always do something because it's interesting or whatever; they're not an easy bunch to keep control of.

#### 4.27 Commitment

The researcher has been kept informed of the career developments of the individuals who were interviewed for this exploratory study. Within 18 months of the study, of the 9 individuals interviewed only two were still employed in the same organisation. Two had set up their own businesses and five had gone to work for other organisations. Mobility within this profession has long been under discussion due to the low numbers of qualified professionals and the specialised skills

associated with IT work (Green and Ashton, 1992; Cappelli, 2001). Commitment to the organisation has therefore been difficult to elicit from these workers as they are easily able to set up their own businesses, work as consultants and have skills which are specialised and in fairly high demand (Bartol and Martin, 1982). As noted the commercial manager suggested that there were low levels of commitment to the organisation:

Interviewer: Is there anything that you could ...any reasons that you could attribute to their lack of commitment?

CM: ...one of my frustrations is the fact that we give them lovely cars, we give them lovely premises, we give them flexibility in what they wear, we give them flexibility in their hours , they're on generally good pay, they are generally...

CM: ... People will always come and go in this business ...I think developers will hang around for a couple of years but invariably I think they will- you look at any of the CVs that we have in – they all chop and change every year/eighteen months. I think that's just the nature of the beast – they basically want to acquire new skills....I would be amazed if anybody stays with us for longer than 3,4, 5 years – 2 years maybe...they want a fresh challenge, they want new code to write....

It is apparent from the second excerpt above that the CM recognises that much of the difficulty in retaining developers is associated with the labour market and their ability to move when they wish. SDC1 also articulates this with the attribution of a certain degree of independence and arrogance to this behaviour.

SDC1: Developers typically move around a lot – I'm not happy here I'll go and find another job so management of that is a very sort of ...developers feel that the companies need them more than they need the companies...Developers don't like to be told how to do things generally either.

It is also acknowledged that this is connected with the developers need to move on to new challenges and that this overrides all of the usual techniques which would be employed to retain employees. The ability to provide new challenges and opportunities to use new technologies and acquire new skills is perceived by this manager as being key to eliciting developer's commitment to an organisation. The extent to which an organisation is able to provide this level of challenge and opportunity for development is highly contingent upon the organisational culture, its products and also the sector in which it operates. However, there is an assumption here that retention of employees and high levels of commitment are desirable from a workforce and it may be that in knowledge based organisations high turnover facilitates innovation and new product development. Commitment should be examined further in order to determine the extent to which this is relevant to knowledge workers in contrast to non-knowledge workers.

### 4.3 Discussion

The data from the exploratory study builds upon the themes which emerged from the literature in chapter two which were used to establish the knowledge worker and non-knowledge worker archetypes. Each of the key facets of the archetypes will be discussed here in relation to the literature from the previous chapter as will those themes which emerged from this study. It should be noted that this study did not enable data to be collected relating to non-knowledge workers and therefore the primary focus is upon knowledge workers, with some discussion relating to the non-knowledge worker archetype, primarily in contrast to the knowledge worker archetype.

#### 4.3.1 Creativity and problem solving

Creativity and problem solving were determined to be key characteristics of the knowledge worker archetype as these themes were closely associated with the generation and application of new knowledge (Kelloway and Barling, 2000). The subjects generally considered themselves to be creative, particularly when considering development of code and in generating solutions related to programming problems. This was also connected to understanding and applying logical thought processes to the code. This supports the suggestions of Reich (1991), and Despres and Hiltop, (1995) in identifying the connection between creativity and problem solving for knowledge workers. The level of stimulation attributed to this type of work was evident in the responses from the subjects. This was associated with the level of challenge available within the work, an aspect of the work that Purcell et al (2009); Swart (2007) and Horwitz et al (2003) determine as being of import in stimulating knowledge workers and eliciting commitment to the organisation. In applying Frenkel et al's (1995) model of the Act of Work (see fig. 2.2) it would suggest that these software developers are indeed knowledge workers given that they consider themselves to be highly creative. The other dimensions of Frenkel's model are also covered by the subjects' responses as they would need to have high intellectual skills and high levels of theoretical knowledge in order to be able to adequately solve these types of problems. This would place them firmly in the knowledge worker corner of the model. The ability to freely develop solution to problems and derive satisfaction from this activity is closely related to the act of creativity. One developer regarded the pursuit of the problem as being akin to a creative act with the only difference being the use of his brain rather than his hands (SDC2). The act of creativity, or problem solving, within knowledge work is evident within this study and serves to demonstrate that it is one of the keystones of the work both in terms of the nature of the task and in terms of the workers desire to encounter challenge from their work. This creative aspect

of the work is seemingly closely connected to the level of autonomy that is experienced by and required by the subjects in their work.

#### 4.32 Autonomy

Autonomy is, alongside creativity, prominent within the knowledge work literature and, as such, is established as key characteristic of the knowledge worker archetype. It appears that it is closely associated with the requirement to make decisions within knowledge work and there is an apparent overlap here with the latitude that is given to these workers in allowing them to solve complex problems. This is considered by Tampoe, (1993), Despres and Hiltrop, (1995) and Alvesson (2004) to be a substantial aspect of knowledge work. This is in contrast to non-knowledge workers who are seen to be asked to perform tasks and told by what means they are to achieve this. The knowledge workers in this study illustrate that autonomy is a significant aspect of their work in that frequently their only constraint is a project deadline. Other than that, they are able to determine 'how you do it, when you do it and how you do it' (AP). The EIU report (1998) locates 'varying degrees of detail in the work' and 'imprecise information inputs' as being facets of highly complex knowledge work. Purcell et al (2009) again suggests that autonomy or independence in the work is important in promoting satisfaction and commitment in knowledge workers. However, one of the subjects suggested that too much autonomy could be detrimental as it may affect the quality of the work. This may also be considered as being important in understanding knowledge workers further given that one of the aspects of the archetypes was that there are lengthy feedback cycles within knowledge work. (Despres and Hiltrop, 1995) It suggested that autonomy, freedom and independence may need to be tempered in order to ensure that good practice is developed. Desire for autonomy may also be connected with knowledge workers' readiness to engage in decision making activities which is not widely evident in the non-knowledge work archetype (Bentley and Yoong, 2000; Wickramasinghe and Ginzberg, 2001). The subjects within this study are therefore seen to demonstrate experiences which resonate with the predominant characteristics of the knowledge worker archetypes.

#### 4.33 Identification

The focus of identification for the knowledge workers in contrast to non-knowledge workers in the archetypes is suggested to be with their network, profession and peers in contrast to the non-knowledge workers identification which is suggested to lie with the organisations. Marks and Scholarios' (2007) work suggest that there is a substantial difference in the foci of identification which is related to the occupation rather than to the profession. None of the subjects in the current study were members of a professional body and yet they all considered themselves to be professionals. The nature of identification appears to lie outside the boundaries of the organisation

and can be seen to fit with the knowledge worker archetype. The subjects considered that their levels of theoretical or specialist knowledge (which locates them as knowledge workers in Frenkel et al's model (1995)), alongside perseverance and confidence were significant aspects of their identity which they shared with other software development professionals. In this line of questioning these workers talked of their expertise (Blackler, 1993), cognitive skills (Collins, 1997; Lee and Maurer, 1997) and analytical skills as being predominant characteristics of software developers. Whilst this study confirms that identification is a significant aspect of the knowledge worker archetype the focus of this identification requires further investigation in order to determine the extent to which it differs to non-knowledge workers.

#### 4.34 Motivation

The subjects generally suggested that they were motivated by the nature of the work that they were doing rather than any additional rewards. The commercial manager demonstrated his frustration as his strategies for motivating and satisfying these workers, which tended towards the use of extrinsic rewards, did not seem to be working. Tampoe, (1995) identified that intrinsic rewards were most significant in motivating knowledge workers and the evidence from this study supports this finding. They expressed that they primarily wanted to 'do interesting work' and be challenged. Again this appears to link to the nature of the job itself and the complexity of the tasks in which they are able to engage (Newell et al, 2002). This also contrasts markedly with the non-knowledge worker archetype who is considered to be engaged in highly structured tasks which require low intellectual skill (EIU, 1998; Frenkel et al, 1995). When questioned specifically upon reward the subjects expressed their lack of interest in monetary gain and cited 'being told you're doing a good job' (SDC1) and 'recognition' (WD1) as being of greatest import. This suggests that there are fundamental differences in the archetypes in terms of motivation, particularly in attitude towards intrinsic and extrinsic reward, which will have a marked effect upon the way that these workers should be managed and the type of HR practices which are most appropriate for each archetype. However, given that this exploratory study has focused specifically upon knowledge workers this issue should be examined in further detail. One of the themes which was not discussed as part of the archetype development in Chapter 2, nor in the literature, was feedback from and level of interaction with customers and the impact that this has upon motivation. It would appear from this sample that the web developers tend to interact more frequently with external customers and therefore this aspect of the work has a more significant effect on them than it does for the non-customer facing roles. It may be that interaction with the customer is a significant aspect of knowledge work which has yet to be explored fully.

#### 4.35 Job Satisfaction

The subjects were questioned directly about job satisfaction and many of the responses were similar to those regarding motivation. The primary source of job satisfaction was found, as previously suggested, to be related to job challenge and problem solving or 'the thrill of having...a challenging problem' (WD1) which was recognised by Tampoe (1993). However, this was also related to knowledge of the appropriateness of the work and the notion of doing a 'good job' (AP). This sense of achievement and satisfaction with the work, derived from feedback, was not connected to gaining a bonus or monetary reward but was in order to gain a sense of intrinsic satisfaction. This highlighted problems that existed in the organisations feedback mechanisms in terms of feedback being easily channelled from the customer, through the organisation, to the worker. This was not discussed within the literature and should be explored in further depth to establish whether it is a significant characteristic of the knowledge worker archetype.

#### 4.36 Commitment

Commitment to the organisation was considered by Purcell et al (2009) to be a fundamental outcome of appropriate HR practices for professional knowledge workers and this was included within the knowledge worker archetype. Given that loyalty and identification are suggested to be located outside of the organisation for knowledge workers there are some questions as to whether commitment would be affected by this. The subjects in this exploratory study were not questioned directly about their attitudes to the organisation in this regard but the high levels of mobility in the software development occupation cast a shadow over the commercial manager's view of his employees' commitment. The commercial manager noted that they tended to move around frequently which he attributed to their desire to learn new skills...'they want a fresh challenge; they want new code to write' (CM). The general level of commitment was clear in that all but two of the individuals had left the organisation 18 months after the interviews. This evident lack of commitment to the organisation may be as a result of a particularly favourable labour market but it may be more indicative of the recurring themes demonstrated by this study relating to the challenge of the work, complex problem solving and acquisition of new skills.

#### 4.4 Conclusion

One particular comment from a developer resonated with the broad descriptions of knowledge work in the literature:

SDC2: ...it's my dream job actually.  
 Interviewer: Is it? What makes it your dream job?  
 SDC2: Er...because it matches exactly what I can do best. I have an analytical mind and logically thinking and I'm fast thinking and that is exactly what I need here in this job. And maybe it's a fight with the machine I don't know! (laughs). It's producing something; I'm not talented to produce a table or something like this so I produce software, computer programmes...and this is what I can do. I have exactly the same feeling when I have done a computer programme and it's working then if somebody else is doing a chair of producing something else with their own hands

This excerpt draws together some of the main themes evident within the knowledge worker archetype and illustrates the notion that this type of worker is akin to an artisan in the way in which he produces the product and in the level of importance that he places upon the creative process. It demonstrates that this exploratory study has proven fruitful in combining empirical work with understandings of knowledge work(ers) derived from the literature review. This exploratory study has examined software developers in a case study context in order to examine the key characteristics of knowledge workers derived from the literature review in Chapter 2. The broad themes which have been discussed in this chapter, emerging from the literature reported in Chapter 2 and subsequently the exploratory study described here can be seen to include key characteristics of the developers, the job role and also outcomes of the relationship between the organisation and the individual (outlined in Table 4.2).

Individual and Job Characteristics	Outcomes	Management Practices	Organisational and Occupational Context
Analytical skills	Motivation	Performance Management	Perceptions of management and organisation
Creativity	Job satisfaction	Recognition	Occupation and career
Skills and knowledge	Commitment	Retention	Professional identity
Autonomy		Rewards	Small business environment
Problem solving			
Customer focus			

Table 4.2 Key themes emerging from the exploratory interviews

This study also demonstrates, alongside the themes which have emerged in this study, the extent to which study of this occupational group can be used to make a substantive contribution to further analysis of knowledge workers. The results from this study confirm many of the characteristics already identified within the archetypes, relating to both the work and the individual workers. There are some themes which emerged relating to feedback and relationships with customers which should be examined further in order to better understand these workers, their perceptions of work and their relationships with organisations. The three themes outlined in the literature review are brought together to develop a theoretical framework (KWCM) for the further analysis of knowledge workers. This thesis therefore continues with Chapter 5 which details the knowledge worker occupational archetypes derived from use of the O\*NET classification before presenting the KWCM, supporting literature and hypotheses.

## Chapter 5 Occupational Archetypes and the Theoretical Framework

### 5.1 Introduction

This chapter builds upon the literature reviewed in Chapter 2 in relation to knowledge work and knowledge workers and draws upon the findings from the exploratory study detailed in Chapter 4 in order to establish a theoretical model and hypotheses. It begins by presenting the archetypes derived from the occupational classification methodology applied as detailed in Chapter 3. These archetypes are derived from the characteristics of knowledge workers and non-knowledge workers from the literature and include occupational classification data to establish clearly the foci for the study. The non-knowledge worker archetype is established and utilised here, much as in many of the models in Chapter 2, as a way of considering the knowledge worker archetype.

It is evident from the development of the archetypes, derived from the predominant themes in the literature and the themes which emerged in the exploratory study (Fig 4.2), that there are broad parallels with the Job Characteristics Model (JCM) (Hackman and Oldham, 1975). In addition to the JCM variables, those of creativity, identification, goal orientation and commitment are included due to their prominence within the archetype development in the preceding chapters. This chapter therefore elaborates on the JCM and subsequently proposes a model which seeks to assess the characteristics of the knowledge worker and non-knowledge worker archetypes, proposing hypotheses about relationships between the variables.

### 5.2 Occupational Archetypes

In Chapter 2 the appropriate context for study of knowledge work was determined to be within the IT sector. There was consistent evidence that software developers could be considered to be representative of knowledge workers within this context. Therefore the exploratory study was undertaken in a small software development house with software developers as the context and the subjects were both consistent with the literature. In order to securely locate the knowledge worker archetype occupationally the O\*NET occupational classification was used as discussed in Chapter 3. This also allowed for a non-knowledge worker archetype to be established to provide a counterpoint to discussions of knowledge work as demonstrated in use of routine or traditional work terms (a commonly used device exhibited in the literature review in Chapter 2). The occupation which was found to have the highest scores using the knowledge work characteristics was that of the software developer. The lowest scores suggested that network/database administrators were the most appropriate non-knowledge worker occupations to establish as part of this archetype. Vignettes of the archetypes are presented below derived from the characteristics established in Chapter 2 and

from the O\*NET classifications related to the archetypal occupations of software developer and network/database administrator.

#### 5.21 The Knowledge Worker Archetype as Software Developer

The knowledge worker archetype is focused upon solving complex problems and generating solutions. Analysis, design and development and coordination are all referred to in the software developers' occupational description. Consultation and conferment with other professionals is required and responsibility for development work is part of the role. Critical thinking and active learning are dominant features of the work. The creation and application of new knowledge is significant in knowledge work, as is decision making and creativity. High levels of autonomy and independence are identified. Network and peer loyalty are characteristic of knowledge workers with little identification with professional organisations. In addition to the aforementioned themes job challenge was seen to be of great significance in line with problem solving opportunities. It was also found in Study 1 that software developers have a high intrinsic motivation with little regard for extrinsic reward and also that feedback from customers is of great importance to them. They tend to display low levels of commitment to the organisation in which they work and move according to whether they have enough interest in the work that they are doing. They perceive themselves to be competent professionals with a strong sense of that identity. Given their desire to be challenged by their work they enjoy learning and expanding their skill sets.

#### 5.22 The Non-knowledge Worker Archetype as Database/Network administrator

The non-knowledge worker would typically be expected to engage in a narrow set of tasks which require limited decision making and limited interdependence upon others. This would typically involve some planning related, focused and predictable tasks. Diagnosis of faults and repair work would be required for network administrators. The database administrator role would involve more project work and liaising with network users. Typically the terminology here is related to task, e.g. plan, do, maintain, administer. The work will have short time horizons and have limited scope for latitude in the task. It is suggested that due to the relatively low rate of change in this work there will be gradual skill obsolescence. Feedback cycles are immediate and low intellectual skills required. In general the job is highly structured with low levels of creativity required. The work is considered to be focused at the individual rather than the team level and the foci of commitment and loyalty will be their careers and their organisations.

These archetypes are now used in order to establish a theoretical model with hypotheses devised to test the relationships between the variables. The components of the Job Characteristics Model are presented initially as the core model and subsequently additional variables derived from the literature and Study 1 are included. Relevant literature is reviewed in relation to these variables in order to establish the hypotheses in relation to the archetypes detailed above.

### 5.3 The Job Characteristics Model

The Job Characteristics Model (Figure 5.1) was developed by Hackman and Oldham (1975), based upon work previously undertaken by Turner and Lawrence (1965 cited in Hackman and Oldham, 1980), using the Job Diagnostic Survey (JDS).

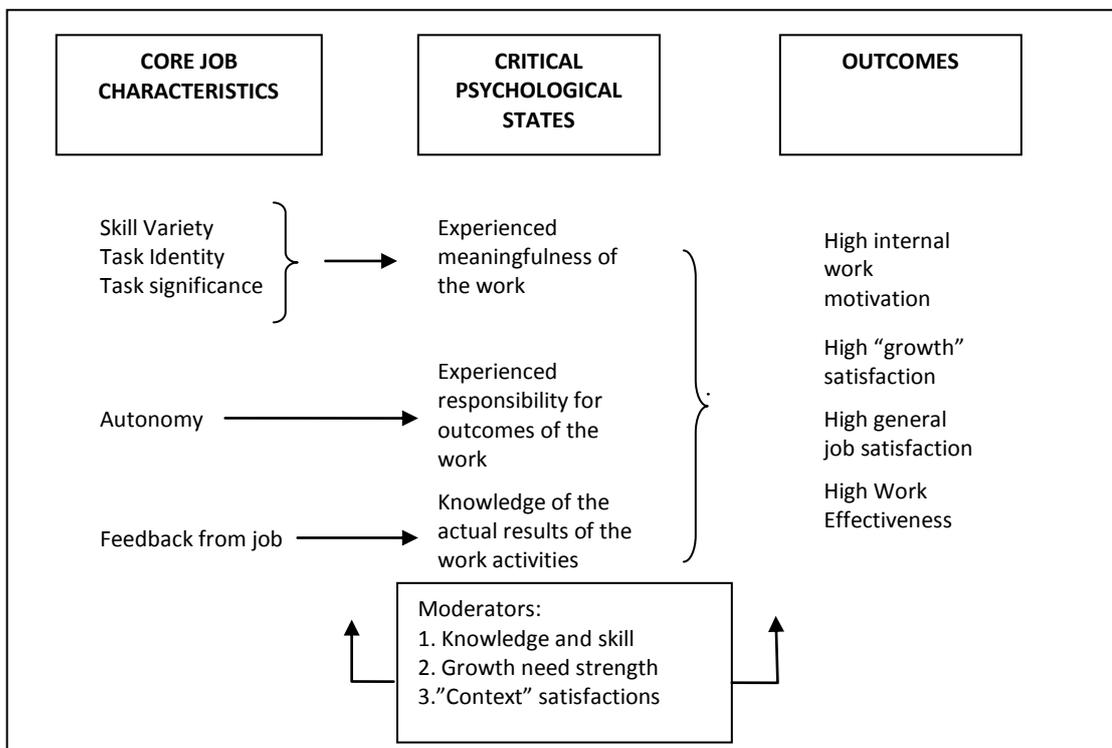


Figure 5.1 The Job Characteristics Model

The original model was based around specific task attributes of the job and employees' responses to these tasks but it has since evolved into a model which is used to calculate the Motivating Potential Score of the job and to redesign jobs accordingly (Hackman and Oldham, 1975). The original JCM studies were conducted pre-knowledge economy where IT was a nascent occupation. Therefore much of the existing JDS data does not differentiate across the range of IT occupations which proliferate today. In contacting the authors (Hackman and Oldham) it has been established that this is still the case, in that there is no new normative data available for the JDS relating to IT workers

beyond that which is reported in the original studies. Within more recent studies of job satisfaction the range of IT jobs is condensed (using WERS data) into one 'ICT professionals' category (Rose, 2007) which belies the range of different occupations which exist within this broad categorisation. The Sector Skills council (e-skills) proposes that this occupational group be divided into eight disciplines (Sambell, 2007) and it should be noted that not all of these would necessarily describe knowledge workers according to the proposed definition for this study. It is considered that use of the JCM is beneficial in that it provides a robust framework for further exploration of knowledge work using a commonly understood architecture. The key facets of the JCM will first be examined before reviewing relevant research related to the theory and the additional variables.

### 5.31 Components of the Job Characteristics Model

The Job Characteristics Model demonstrates the relationships between the independent variables of the Core Job Characteristics and the Outcomes which are mediated by the three Critical Psychological States which are proposed to be directly related to specific characteristics, or combinations thereof. In order to fully detail the model the variables and their definitions will be outlined as will the specifics of the postulated relationships. This will be taken in the order in which Hackman and Oldham (1980) develop the conceptual model in *Work Redesign* rather than according to the direction of the model.

The underpinning concept behind the redesign of work is that it will aid in establishing favourable outcomes of high internal work motivation, high growth satisfaction, high general job satisfaction and high work effectiveness (generally measured by subjective report) which are derived from the presence of three psychological states of experienced meaningfulness, experienced responsibility and knowledge of the actual results of the work (low absenteeism/turnover was included in the original work). Experienced Meaningfulness is defined as the extent to which the job is felt to be inherently meaningful, 'as something that counts in his or her own system of values' (Hackman and Oldham, 2005 p 153). Experienced Responsibility is attached to the level of accountability that the employee feels and the extent to which they feel responsible for the outputs/results of the work. Knowledge of results is perhaps more easily determined in that it requires the employee to have confident knowledge of the results of their work, or be aware of their level of performance.

These psychological states generate positive outcomes but are not considered to be manipulable by altering the facets of the job as they are intrinsic to the individual. However, Job Characteristics Theory (JCT) suggests that presence of the job characteristics will 'increase the chances that a job

holder will experience the three psychological states...' (Oldham and Hackman,2005; p154). Skill variety, Task Variety and Task significance are thought to be directly and uniquely related to experienced meaningfulness. Skill variety is an expression of the range of differentiation in activities that exist within a job and consequently reflects the range of skills and talents that are required from the employee in order to undertake the job. Task identity signifies the extent to which a job calls for completion of an entire, identifiable task, product or service rather than sub-components which do not allow the worker to see the complete piece of work. Task significance is the significance that can be attributed to the task in terms of the import and level of impact it has for the customer, whether internal or external (often the end user in the case of IT work). Autonomy is perhaps of the greatest interest given the prominence of its place in the knowledge work literature and it is determined here to be influential in increasing the experienced responsibility for outcomes of the work. It is termed here as being synonymous with freedom and independence in choosing the order in which, and the way in which, tasks are completed or as being to a greater or lesser degree 'master of one's own destiny'. This may take different forms, with varying degrees of latitude being experienced dependent upon the type of task – for example deciding to use different technologies may not be at the discretion of the individual but how they are used may be highly discretionary and therefore it would be fully expected that the level of autonomy is still experienced as being high. Knowledge of results is increased in relation to the feedback the worker directly receives from their job in form, clarity and frequency. The extent to which the critical psychological states are experienced therefore can be manipulated by the job characteristics outlined above and the Motivating Potential Score can be calculated to allow the job to be indexed in terms of its potential to generate these proposed positive outcomes.

The JCM also identifies that there are three moderating variables of Growth Needs Strength (GNS), Knowledge and Skill and Context Satisfaction, of which only the former was included in the original model. GNS recognises that some people more than others have a need to experience continuous learning and development or a sense of personal accomplishment. The relative strength of this need is captured in this variable which was found to moderate the relationship between the job characteristics and the psychological states and between these states and the outcomes. It is suggested that workers with higher GNS will experience the psychological states more strongly when their job is higher in MPS than those workers with lower GNS. (Hackman and Oldham, 1980). The second moderating relationship for GNS is expressed as a more positive response to the psychological states for those with higher GNS than with those who have lower GNS (Hackman and Oldham, 1980). Satisfaction with the work context is a significant variable in that when the

employee is satisfied with the context they will generally respond well to well-designed jobs and when combined with high GNS will report high levels of the outcomes. If the converse is evident (low GNS and low context satisfaction) then the job characteristics are suggested to have a minimal effect. There were also found to be some negative relationships evident between MPS and the outcomes of motivation and performance here (Oldham, Hackman and Pearce, 1976). With low GNS and low satisfaction present the higher MPS diminished performance as it is proposed that the employees would be potentially have ‘...found a complex and challenging job so far out of line with their needs that they were unable to perform well on it’ (Hackman and Oldham, 1980; p88). The moderator of knowledge and skill is essential in understanding the relationship between the MPS of a job and the outcomes of satisfaction and motivation primarily because their feelings of positivity towards the job are contingent upon their ability to do the job. Hackman and Oldham (1980) make this point by suggesting that when people are presented with tasks that they cannot perform (albeit with high motivating potential) they are likely to withdraw from the situation in order to avoid the pain of consistent failure. In order to examine this facet of the model more thoroughly, and in line with the findings from the previous chapters relating to job challenge, goal orientation is considered to be of interest in determining whether the type of orientation that is predominant in an individual impacts upon the relationships between the aforementioned variables. This will be examined in further detail later on in this chapter.

It should be acknowledged that the JCM has not gone without criticism from a number of authors. It has been noted by Hackman and Oldham (1980, p95) that the evidence for the moderating effects ‘is scattered’ and that context satisfaction needs further research. There have also been some concerns raised about the distinctiveness of the five core job characteristics and the reliability of the factor structures (Fried and Ferris, 1987). Fried and Ferris (1987) also recognised that the mediating effects of the critical psychological states may be problematic as specific job characteristics have been related to other critical psychological states not identified in the JCM. Concerns have also been raised over the moderators, the form of the motivating potential score and the inadequate explanation of relationships between outcome variables. The criticism by Fried and Ferris (1987) of the multiplicative approach to the calculation of the Motivating Potential Score (MPS) was acknowledged by Oldham and Hackman (2005), rather contritely, to be entirely correct and they now concede that the additive approach be taken to this calculation as it is simpler. The issues surrounding the moderators are perhaps less easy to address given that there are too few studies to enable the inclusion of Knowledge and Skill and Context Satisfaction into any meta-analysis (Humphrey et al, 2007). Fried and Ferris (1987) examined the moderating effect of GNS on the MPS – performance

relationship and concluded that there was sufficient evidence to support the hypothesis that the relationship between the two variables was stronger amongst people with higher GNS than for those with lower GNS (.45 and .10 credibility value). Despite the apparent concerns about the JCM, it is still reported by Parker and Wall (1998, p16) to be highly useful in determining outcomes (particularly attitudinal ones) from job characteristics and suggest it 'clearly has some concurrent and predictive value'.

There are some criticisms of the JCM which are noted by the authors themselves (Oldham and Hackman, 2005) in their reflection on the development of the JCM and the contemporary context, recognising that much of the theory development was prompted by their own personal experience of work design and job enrichment in various jobs, being refined cyclically in discussion with colleagues in order to reach the initial JCM. That is not to say that this is any different than most theoretical or empirical work which is, developed cyclically through the making of observations, testing of these observations and revising them accordingly. The model underwent a series of revisions within the 1970's until the final model was reported in the book *Work Redesign* (Hackman and Oldham, 1980), the primary change being the increased emphasis upon internal work motivation and the moderating variables of context satisfaction and knowledge and skill, whilst reducing the prominence of turnover and absenteeism in the model (which is also interesting to note given that still so much emphasis is placed upon this aspect of the model). When considering the aforementioned inadequacies it should be noted that the use of this model is proposed only as a conduit for the further exploration of knowledge workers in line with the project research objectives rather than as a mechanism for the determination of specifics of job design or as a further test of the model's intrinsic validity. Despite its limitations the JCM is considered to be highly pertinent to the development of the themes of this study and examination of the archetypes ultimately in developing understandings of this group of workers. The Job Diagnostic Survey can therefore be used in this research study against the backdrop of the work previously done using this model in a number of other occupational groups and organisations over the last 40 years. It is therefore appropriate that the additional variables are examined in the context of the literature and the associated hypotheses established in order to substantiate the proposed positions within the architecture of the model. As the fundamental framework of the JCM has been established the Knowledge Worker Characteristics Model will now be presented with a review of the related literature and hypotheses.

## 5.4 The Knowledge Worker Characteristics Model

The Knowledge Workers Characteristics Model (KWCM) demonstrates the core architecture of the JCM with additional variables presented in line with the forthcoming hypotheses. These variables are core to the archetype development in the preceding chapters derived from the knowledge worker literature, the exploratory study and the occupational categories. It is constructed with reference to the job and the person characteristics located within the occupational context of IT and it will be referred to with reference to relevant literature and associated hypotheses. The model will be addressed left to right, initially with the core job characteristics and with the addition of creativity. The variable of goal orientation will then be included with the final discussion focusing upon the outcome variables including commitment and identification.

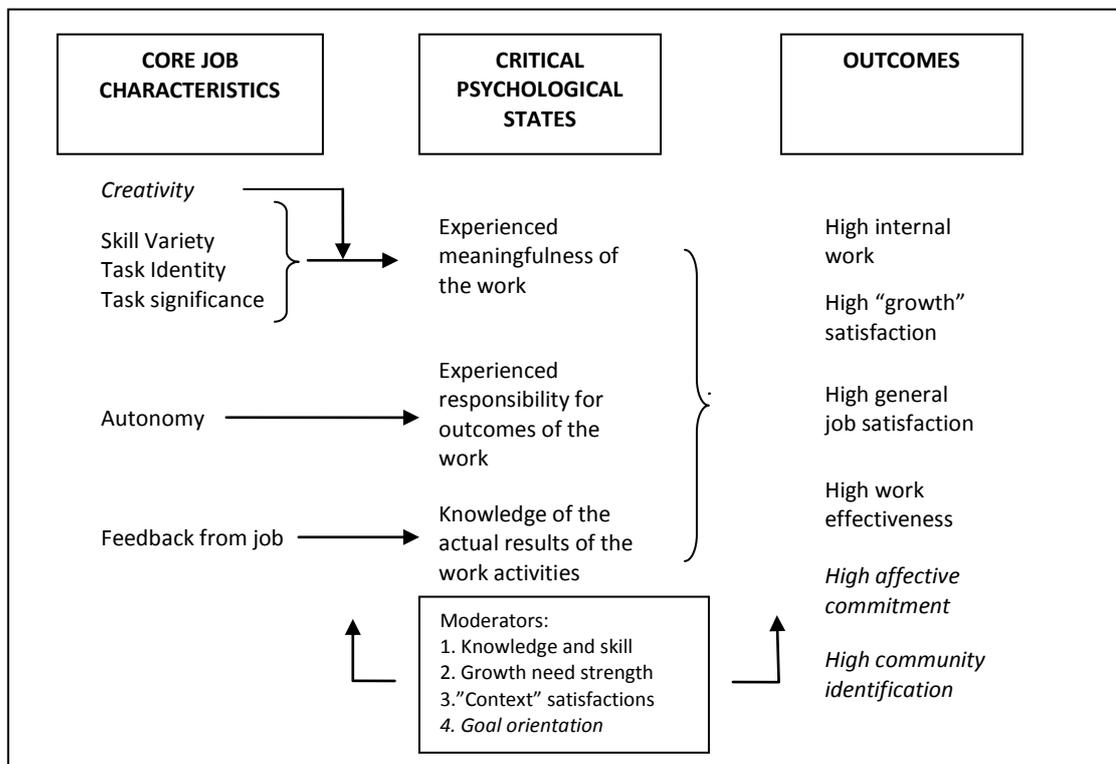


Figure 5.2 The Knowledge Worker Characteristics model

Many of the challenges laid down by Fried and Ferris (1987) remained untested for twenty years until the development of Humphrey et al's (2007) meta-analytic study which was designed to re-examine the model with a greater body of research to draw upon. Humphrey et al (2007) identified that work design has suffered from continuously focusing upon the motivational features of the subject rather than taking a more holistic view of the domain. In an attempt to take a broader approach combining social and contextual features of work design with the much researched motivational aspects, the

authors conducted a meta-analysis to test the central tenets of the JCM with a range of additional variables which comprise the aforementioned expanded work design model (see Fig 5.3 below).

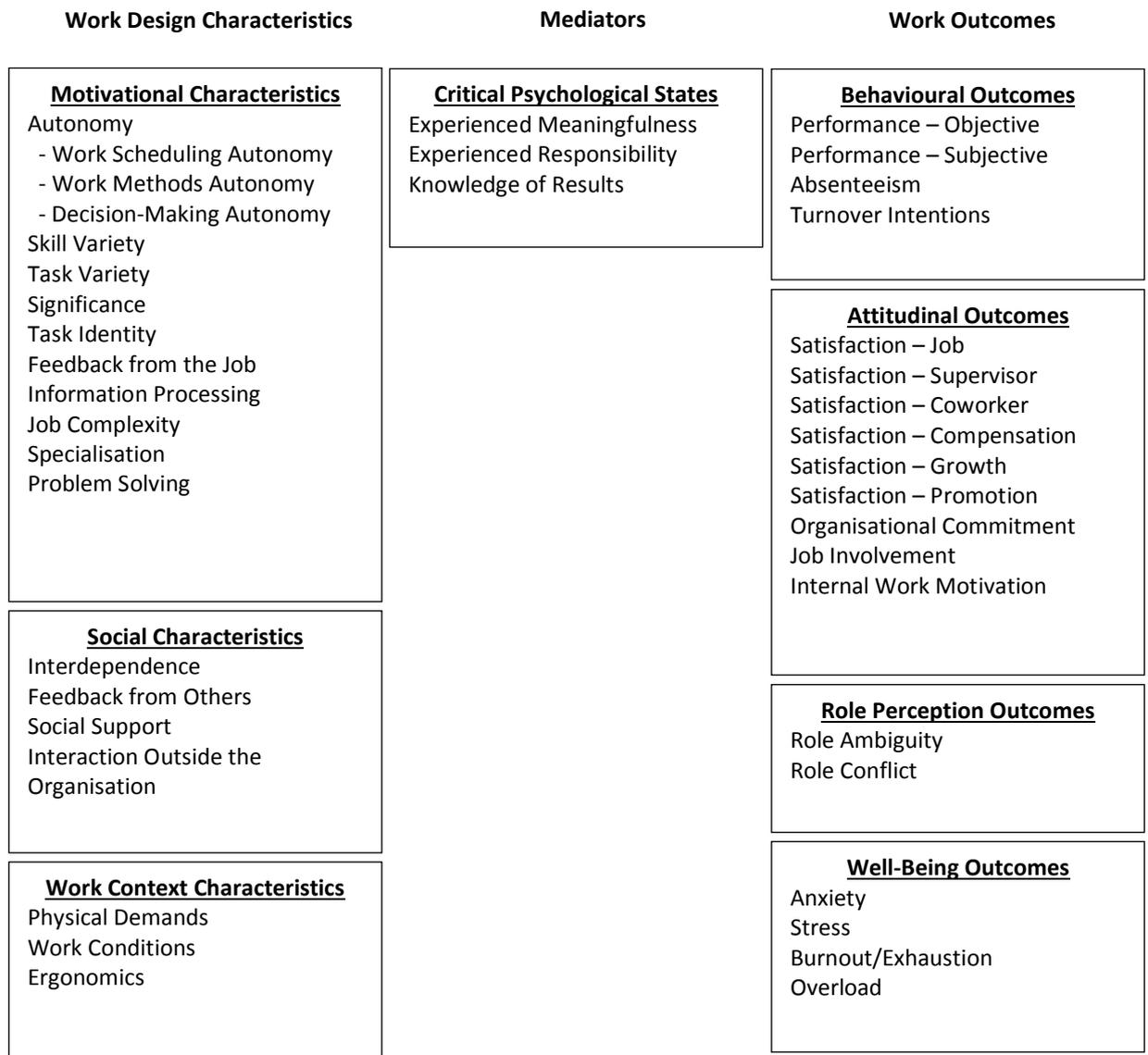


Figure 5.3 Expanded Work Design Model

An additional focus of Humphrey et al's work was the updating of Fried and Ferris' (1987) meta-analysis which summarized 76 studies and used bivariate correlations to test the JCM. Humphrey et al (2007) tested their model using Baron and Kenny's multi-step mediation process on data derived from a comprehensive literature search using key phrases from the lexicon of work design/analysis. This resulted in a list of over eight thousand articles which were then reduced to 259 articles to meet their criteria of no replication in the studies, having sufficiently large samples sizes and there being at least one relationship investigated which is relevant to the expanded work design model. Results of

the study showed that there was evidence that the motivational, social and work context characteristics were indeed unique and should therefore be included in further research. With respect to this observation and the construction of the KWCM, it was felt the motivational characteristics were adequately represented by the job characteristics and the additional variables. The social factors could warrant further investigation as interdependence, feedback and interaction outside the organisation were identified within the archetypes. However, it was determined that they are best examined within the third empirical study, using qualitative methods, particularly as it was also considered important that the survey tool should not become unwieldy and too lengthy. Humphrey et al's (2007) work tested hypotheses in Hackman and Oldham's model with the expectation of their findings being in line with Fried and Ferris' (1987) conclusions of strong positive relationships between the core job characteristics and job satisfaction, growth satisfaction and internal work motivation but with weaker relationships demonstrated with job performance and absenteeism. This was found not to be the case as all of the core job characteristics were found to be positively related to the aforementioned outcome variables with the exception of subjective performance, which did not include skill variety. This demonstrates that the job characteristics can be used with confidence in the KWCM model.

#### 5.41 Skill Variety, Task Identity and Task Significance

In order to understand knowledge workers a greater understanding of the nature of their jobs should be established. Therefore, the core job characteristics are presented for testing within the model. Hackman and Oldham (1980) note that skill variety is an expression of the range of differentiation in activities that exist within jobs and that this therefore denotes the breadth of skills and talents which are required of the worker. Evidence from the development of the archetypes suggests that knowledge work is characterised by high levels of complexity and scope within the work (EIU, 1998; Newell, et al, 2002; Despres and Hiltrop, 1995). Skill variety may therefore be expected to be prominent in knowledge work and therefore a wider skill set is likely to be required of knowledge workers. It can be assumed that non-knowledge workers will therefore engage in a narrower range of tasks given routine work is said to have 'narrow scope' ( EIU, 1998; Despres and Hiltrop, 1995). It is therefore hypothesised as follows:

*H1 Skill variety will account for a greater amount of variance in experienced meaningfulness of the work for knowledge workers than non-knowledge workers.*

There is little evidence from the development of the archetypes to suggest differences between knowledge workers and non-knowledge workers with regards to task identity. The notion of a 'whole

piece of work' may differ dependent upon the type of tasks engaged with and what it means to do 'a job from beginning to end with a visible outcome'. This is particularly the case with IT work given that tasks are rarely seen in isolation from the larger systems and may overlap with work being undertaken by colleagues. Similarly, task significance is difficult to define in terms of the level of impact that it has upon an end user or an internal customer. This, in itself, is not evident within the knowledge worker archetype. However, there was evidence in the exploratory study of customer feedback being significant in motivating the knowledge workers which suggests that there is a need to see value in the work being undertaken. Given this evidence it is hypothesised as follows:

*H2 Task significance will account for a greater amount of variance in experienced meaningfulness of work for knowledge workers than non-knowledge workers.*

As previously discussed Humphrey et al (2007) used a more sophisticated method of analysis, regarding the JCM mediators, than those used by Fried and Ferris (1987), by employing Baron and Kenny's method (1986). In the second step of their analysis, where the mediators are regressed onto the core job characteristics, there were found to be moderate to large relationships. The results of the regression analysis showed that experienced meaningfulness of work was found to strongly mediate skill variety, task identity and task significance. Therefore it is considered that it can be used with confidence with regards to the testing of hypothesis 1 and 2.

#### 5.42 Autonomy

Given the prominence of autonomy as a feature of knowledge work in the literature and its importance within the exploratory study it takes a significant role within the knowledge workers archetype. Humphrey et al (2007) in their examination of the broader behavioural and attitudinal outcomes of the JCM establish relationships between all of the Core Job Characteristics and a number of foci of satisfaction (e.g. co-worker satisfaction, promotion satisfaction) but it is notable that the strongest relationship here is with autonomy. This emphasises the strength of the relationship between autonomy and job satisfaction which is particularly important given the observations derived from the archetypes. A recent study analysing the JCM using 1998 WERS data (De Varo et al, 2007) also identifies that autonomy is positively associated with worker effectiveness and with job satisfaction. Given the strength of the assertions within the literature and the importance placed upon this by the knowledge workers in the exploratory study it is hypothesised that:

*H3 Autonomy will account for a greater amount of variance in experienced responsibility for the outcomes of the work for knowledge workers than for non-knowledge workers.*

In the results relating to the extended work design model Humphrey et al (2007) demonstrate that the differentiated autonomy variables (work scheduling, work methods and decision-making autonomy) were highly correlated with one another, although as Humphrey et al (2007) observe, this is unsurprising given that they are all facets of the broader construct. The points to note here are that in terms of strength of relationship with job satisfaction, decision-making autonomy was the strongest ( $\rho=.58$ ) with work methods autonomy less strong ( $\rho=.34$ ) and there being no significance in terms of the data for work scheduling autonomy. This differentiation may give greater insight into what is meant by the term autonomy when used within different contexts and within different commentaries relating to knowledge work. It could be suggested that autonomy as a term is too broad to enable sufficient interrogation and, in order for greater understanding of knowledge work to be established, differentiation should be made in terms of work method, decision-making and work scheduling. For this study it is considered to be a factor that can be most appropriately examined within the qualitative study in order that the integrity of the JDS be maintained and so that a fuller understanding of the construct may be established.

There is little discussion regarding feedback from the job within the knowledge work literature and therefore its inclusion in the archetypes is limited other than that which relates to the aforementioned desire for customer feedback. Given that feedback from the job here is specifically focused upon that which comes from the task itself, co-workers and supervisors, it will not measure the type of feedback which emanates from the end-users or customers. It is suggested that this element of knowledge work is best explored as part of the qualitative study. Understanding this type of feedback further may be useful in determining difference between the two archetypes. It could be suggested that this particular type of feedback will be of greater relevance to the non-knowledge worker group given that the JCM was constructed using traditional/conventional work. Also, as knowledge workers are historically considered as being difficult to manage due to the nature of their work (as stated in Chapter 2), it could be suggested that this immediate type of feedback will be of little significance to these knowledge workers. It is therefore hypothesised that:

*H4 Feedback from the job will account for a greater amount of variance in knowledge of the actual results of the work for non-knowledge workers than for knowledge workers.*

It should be noted that in Humphrey et al's (2007) meta analysis there was less convincing support for mediation effects of experienced responsibility on autonomy and no evidence that knowledge of results mediated for feedback from the job. The extended model was further tested in order to assess whether the three critical states should be viewed as separate or combined variables. Humphrey et al (2007) found that Motivational Characteristics and Work Outcomes were primarily mediated by Experienced Meaningfulness of the Work. This was also the case within the JCM in terms of Skill Variety, Task Identity and Task significance but here it is the primary mediator between Autonomy and Feedback from the Job, rather than being mediated by Experienced Responsibility and Knowledge of the Actual Results respectively. This is explained by the authors, with particular reference to Deci and Ryan (2000) and Ryan and Deci (2001), as possibly being due to experienced meaningfulness being an overarching goal of human kind and therefore one through which all intrinsic motivation and positive outcomes is mediated. It is essential that this is borne in mind when analysing the data in relation to the aforementioned hypotheses.

#### 5.43 Creativity

Creativity and problem solving are featured prominently within the knowledge worker archetype as being a significant aspect of the work with knowledge workers frequently described by various authors as 'creatives', innovators and knowledge creators. It appears that this aspect of knowledge work is one of the defining features, alongside problem solving and intelligence, of the organisations which form part of the knowledge economy (Alvesson, 2004). After conducting the exploratory study and undertaking the literature review, creativity has been identified as being a key theme which should be investigated in greater detail in the empirical aspect of this study. It is therefore inserted into this model as one of the core job characteristics which impacts upon experienced meaningfulness of work (although it is not treated as being combined with skill variety, task identity and task significance). The rationale for this will be further explained by clarification of the concept of 'creativity' within the literature (including an examination of problem solving as part of this domain), a discussion of creativity in software development settings and an assessment of the possible implications for managing this group of workers derived from the creativity literature.

Knowledge workers as software developers are deemed to be part of the 'creative industries'. These 'creative industries' which are considered to have '...their origin in individual creativity, skill and talent...' are held to be at the core of the 'new economy' (Department for Culture, Media and Sport, 1998 in Townley et al, 2009). Similarly, Christopherson (2004, cited in Thompson and McHugh, 2009) recognises workers in software production as being part of the new media sectors which are populated by 'creative workers'. Although, it should be noted that this location is in itself

problematic as it could be considered to be forming a circular definition whereby knowledge workers are described as being creative and this in turn is used as an identifying feature of knowledge work(ers) (Alvesson, 2004). This criticism could also be levelled at the development of the definitions and characteristics of creativity. Creativity is a term which has suffered from similar definitional issues to those surrounding knowledge work and it has ‘...traditionally been associated with a somewhat mystical process’ (Andriopoulos and Dawson, 2009; p 19). This in itself is a matter of contention as creativity can be viewed both as a process and as a facet of an individual’s character. Whilst a process approach is taken here it should also be noted that other authors have focused upon individual characteristics that are responsible for creativity which impact upon group creative experiences.

Plucker and Renzulli (1999) acknowledge that a variety of approaches have been taken to the study of creativity and identify four broad themes from within the domain these being: creative processes, personality and behavioural aspects of creativity, environmental aspects and creative product. It is clear that there is a diversity of approach in this domain but the literature review in the area of the creative process approach was consensual in acknowledging the need to move beyond the divergent-thinking aspect of the creative process towards exploring creative problem identification and evaluative thinking.

The concept of creative process engagement (CPE) is also advocated by Zhang and Bartol (2010a) as a useful measure of creativity. CPE is broadly used to describe the methods by which an employee engages in problem identification, information searching and idea generation. It is essentially used to describe activities which combine to generate a creative outcome where fullness of engagement is perceived to be important in generating ‘solutions that are both novel and useful’ (p112). The extent to which the employee is fully attentive to the problem, is fully aware of the nature of the problem from a range of different perspectives and the diversity of information sources available to aid the solution are felt to all contribute to generating a greater variety of alternatives than would be expected if this process was less well engaged with (Zhang and Bartol (2010a).

Amabile’s componential framework of creativity can be used to develop understandings of the creative process through empirical work. The component interactions and the general process is considered to be applicable to all levels of creativity but it is suggested that all components need to be present in order to generate a creative outcome, that is one which is high in creative content. Amabile (1996) uses the term ‘high’ and ‘low’ levels of creativity in discussion related to this

framework which she cautions against in other work as previously discussed preferring to use the creative continuum to describe creative outputs. The componential framework model can be used as a method of explaining the stages of creativity in which individual's engage which is particularly important if, as previously suggested, knowledge workers and non-knowledge workers can be differentiated by the presence of creativity in the work. In order to support the empirical work in this study the componential framework will be described in its basic stages.

The first stage of the process is the formulation of the problem (note here that within IT work discourse this is a commonly used terminology which may refer to anything which needs to be solved or, to which a solution can be applied rather than something which is perceived as a pejorative term, that is, as something which is unusual or problematic). The second stage is preparation which is described as building up or 'reactivating' information stores or algorithms which leads into the third stage of generation of responses (both from internal and external stimuli). In the fourth phase of response validation the domain relevant skills are drawn upon heavily in order to assess the solution generated and then the process is either completed, abandoned or reemployed in order to reach the desired 'solution'. Much of the re-employment activity and tenacity in problem solution within the process is suggested, as outlined previously, to be determined by intrinsic motivation derived from the task or the problem being worked upon. In the explication of these stages Amabile (1996) differentiates between the extent to which heuristic and algorithmic tasks/responses will require use of all stages of the model suggesting that the latter type of task generally requires 'no room for exploration of various pathways, no room for novelty and hence, no room for creativity' (p97).

The componential component model contains similar components to those identified by Rogalski and Samucay (1990) in their conceptualisation of knowledge representation in IT programming work and also their schema for the task of programming. Whilst the term creativity is not directly used within this text the notion problem solving is seen as the starting point for all programming activities, as is also suggested in the creativity literature. The task of programming here identifies a number of similar paths and processes to those suggested by Amabile (1988). This similarity could be attributed to the model content being derived from planning research and also to similar foci within contemporaneous literature. The pursuit of 'problem solution' is perceived here to be a sophisticated process which uses, for complex problems, various sets of heuristic schema in a creative process to arrive (driven primarily by intrinsic motivation) at a suitable solution. It is clear therefore that IT problem solving can be viewed as a creative process which can be attributed differently to the type of tasks engaged in.

#### 5.44 Creativity as Problem Solving

Within discussions of the process models of creativity it is apparent that it is also perceived as being synonymous with problem solving (Amabile, 1988; Wallas, 1926 and Basadur, 1982 cited in Amabile, 1996). The latter of these authors saw the creative process as being the identification and solution of a problem through to its implementation. It is unsurprising therefore that the literature review table identifies problem solving as a recurring description of one of the facets of knowledge work(ers) if they are also perceived to be engaged in creative processes. The various process models allow an articulation of the creative acts which occur in organisations with the suggestion that they are comprised of a series of indiscernible iterations within each phase of the creative process, as the creators or innovators interact with their external environment. Higgins (2007) examined the process of creativity/problem solving in a team of software developers in an ethnographic study of a small development team and noted:

‘Developers explore problems, alternatives, conjecture and propose actions, sometimes taking action there and then, decisively hacking then justifying their actions. The work of programming is not always straightforward, smooth or logical.’

(Higgins, 2007 p 480)

This demonstrates the level of complexity involved in the problem solving process for developers and the extent to which it is heuristic, rather than algorithmic, activity which is engaged in.

Kay (1991) examined the process of the acquisition and honing of knowledge in programming, proposing that the type of problem solving was dependent upon the level of expertise that the programmer possessed. From a review of the empirical work on programming skill acquisition Kay asserts that the complexity of the representation of computer knowledge increases with the level of expertise from the exposition of very simple binary relationships to complex relationships ‘...encoded into higher level knowledge structures’ (p324). This emphasises the impact that experience has upon the complexity of the application of the knowledge and the sophistication of the problem solving activity. It refers to the ‘tuning process’ which takes place once the basic domain specific procedures have been acquired. In Kay and Black’s (1990) model, derived from examining those who engaged in text editing, the phases of knowledge evolution were described as: Phase one – existing knowledge representations; Phase two – first reorganization of knowledge into goal/actions; Phase three – realization of frequency of use of specific commands – creating sequences from Phase two into a broader plan; Phase four – expertise characterised by compound plans using the more simplistic plans from phase three. This process is a contemporaneous account of expertise development

within early programming work (although in early programming work the word user is synonymous with the programmer and should not be confused with the term end-user). The final stage here of expertise is similar to the final stages of the componential framework and is similar to Zhang and Bartols' (2010a 2010b) idea generation activity. It also resonates with the notion of expertise and complex problem solving from the archetypes.

The aforementioned literature suggests that heuristic problem solving takes place where the problems are most complex and 'wicked', with algorithmic activities taking places to the left of the componential framework in response to less demanding problems. The algorithmic aspects of the process may be seen to incorporate problem identification and information searching aspects of the creative process (Zhang and Bartol, 2010b). In addition to problem identification and information searching, the ideas generation aspect of the creative process maybe engaged in where complex problems exist and there is a need for more heuristic activity. The former description may be suggested, given the archetype characteristics, to be akin to non-knowledge work where the problems are highly structured and defined in contrast to knowledge work which is characterised by complexity and lack of structure. It is therefore hypothesised that knowledge work will require more idea generation activity as part of the creative process, hence its inclusion as part of the job characteristics:

*H5 Knowledge workers will report higher engagement in ideas generation activities than non-knowledge workers.*

*H6 Ideas generation will account for a greater amount of variance in experienced meaningfulness of work for knowledge workers compared to non-knowledge workers.*

The outcomes of high internal work motivation and high work effectiveness shown in the JCM could be suggested to be components of the aforementioned creativity models, in that, engaging in the creative process was found to be positively correlated to job performance whereby the individual's reaction to the intrinsic properties of the task generate a motivational state. The importance of intrinsic motivation for knowledge workers needs to be examined within the proceeding studies in order to determine the importance of creativity in generating job satisfaction as this will generate a deeper level of understanding as to the appropriateness of the management practices which are currently used for knowledge workers.

This engagement in creative processes may also impact upon the way that knowledge workers are managed and the way that they are motivated. Amabile (1993) asserts, supported by a number of empirical studies, (Amabile, De Jong and Lepper, 1976; Deci, 1971 cited in Amabile, 1983; Amabile and Gryskiewicz, 1989) that extrinsic rewards can be prove to be detrimental to creative performance whereas extrinsic rewards can be encouraged through extrinsic motivators. This would suggest that there may be a marked difference between the requirements of knowledge workers and non-knowledge workers in terms of the efficacy of reward practices. Aspects of the work which are found to be present within the knowledge workers archetypes such as autonomy and a sense of interest, challenge and stimulation from the work/task were also found within Amabile's studies to be intrinsic motivators. It could therefore be considered unsurprising that these are frequently mentioned simultaneously as characteristics of knowledge work in the literature reviewed in Chapter 2. These issues should also be explored further as part of the qualitative study in order to discern whether assumptions about motivation and reward are misguided in relation to knowledge workers.

The need to examine knowledge workers types of engagement in creative processes is evident in order to establish a fuller picture of the archetypes and the impact that this variable may have upon job outcomes and organisational interventions. However, the need for stimulating and challenging work, to solve problems and to learn from those problems alludes to another facet of knowledge work which is suggested strongly by Amabile (1983) and Deci and Ryan's (2000) work. The goal orientation of the individual may have considerable effect on the need for these aspects of work and also in determining the impact that the work has upon motivation and job satisfaction. It is considered therefore that this construct, given its close association with CPE and the extent to which learning and problem solving was evident within the exploratory study, should be examined in further detail in order to hypothesise how this might be different in knowledge workers as compared to non-knowledge workers.

#### 5.45 Goal Orientation

Attention now moves to the role of goal orientation in moderating between the job and the psychological states and the outcomes. The literature relating to goal orientation will be examined and applied to the knowledge work discussion and hypotheses will be proposed. Whilst the exploratory study in Chapter 4 does not explicitly see knowledge workers making reference to their own goal orientation, nor were any specific questions asked using this terminology, there is a suggestion that creativity and propensity to seek out problems contributes to their perception of a rewarding role and to deriving satisfaction from their work. The knowledge worker archetype is

considered to desire high levels of personal growth and wishes to learn and be constantly challenged. It was considered that, given these observations from the literature and from the exploratory study, that goal orientation may offer some further explanation as to why workers in similar roles may find that role more or less stimulating, particularly when trying to establish the distinction between the non-knowledge worker archetypes.

The concept of goal orientation (GO) was originally researched in relation to pedagogy and child psychology in order to assess the subjects' responses to given problems. Dweck (1986) reports that two contrasting responses were evident, those who were found to have a learning orientation were inclined to meet problem intensification as a challenge and therefore demonstrated high levels of resilience in the tasks. Those who were deemed to have a performance orientation were less resilient and became disengaged when they could no longer perform the task. Nicholls (1984) referred to the former groups as task-involved and the latter as ego-involved whereas Ames (1984) terms these groups as 'mastery focused' and 'ability focused' respectively. Whilst these early audits tested the constructs in children, a growing body of evidence emerged from tests within the adult population with VandeWalle (1996) exploring goal orientation in occupational settings. It is evident from the early studies that disposition impacts upon behaviour with regards to goal setting which is a prominent and frequently used organisational method used to drive employee performance. This research suggests that the goal orientation of the individual has the potential to have a significant impact on their sense of motivation, of job satisfaction, affective commitment and ultimately upon their performance with VandeWalle (1996) suggesting that it is a personality dimension that influences affective, behavioural and cognitive reactions.

Knowledge worker archetypes, characterised within the literature as creative problem solvers who require challenging tasks would therefore be expected to exhibit high learning orientations in comparison with non-knowledge workers. Therefore it is hypothesised:

*H7 Knowledge workers will report a higher learning goal orientation than non-knowledge workers.*

Whilst Dweck's (1986) initial conceptualisation of goal orientation identifies only a distinction between learning and performance orientation VandeWalle et al's (1997) work points to performance as being sub-categorised into prove and avoid dimensions. VandeWalle's study aims to examine these 'dispositions towards developing or demonstrating ability in achievement situations' (1997, p996) and establishes a scale of orientation which acknowledges the aspects of 'prove' and

'avoid' (the details of the scale pertaining to reliability and validity are provided in Chapter 3). The scale development was a response to Dweck's (1986) work in recognising the different responses to challenging tasks as being adaptive or maladaptive which was suggested to be displayed by the subjects as a result of them having formulated very different goals. VandeWalle recognises that management research can benefit from further exploration of this field in conjunction with simultaneous work on goal-setting (Locke and Latham, 1990). The latter focuses upon outcomes relating to 'goal specificity, goal difficulty and goal acceptance upon goal attainment' (VandeWalle, 1997, p997) whilst goal orientation examines the higher order factors which impact upon goal setting and attainment.

VandeWalle's scale development work recognises that it is reliant upon the conceptual advances of Bandera and Dweck (1985) and Legget and Dweck (1986) (cited in VandeWalle, 1997) who initially investigated goal orientation as a binary opposition whereby either a goal or performance disposition was exhibited in task preference. The domain developed further by acknowledgment that both could be held simultaneously and were therefore separate dimensions (Farr et al, 1993). As previously mentioned the work of Nicholls (1984) suggests that 'ego-involved' behaviours demonstrated desire to 'prove' through the task or to 'avoid' failure. VandeWalle acknowledges that this distinction is inadequately substantiated in Nicholls (1984) scale development and therefore seeks to build upon Elliot's (1994) meta-analysis which examined performance goal orientation and its predictive power in relation to intrinsic motivation. The avoid, prove and learning orientations were defined and scale development undertaken. Suffice it to say that the three factor structure was found to be valid and thus provides a method of examining GO in organisational contexts. This is also supported by Elliot and Harackiewicz's (1996) identification of differences between two types of performance goal orientation in their examinations of task involvement and intrinsic motivation.

VandeWalle et al's (1999) longitudinal study of a sales workforce examined the relationships between goal orientation and intended planning and effort, in addition to the level of self-set goals related to performance, (particularly the mediation of these goal related 'tactics'). The performance outcome was measured as sales for a quarterly product promotion in a sample of 167 salespeople (of whom the majority were male, 84%) with a mean age of 38.63 years. The subjects completed VandeWalle's GO scale and also a measure pertaining to self-regulation tactics at the beginning of the sales drive which were then used in conjunction with sales data (it should be noted that the organisation did not impose goals upon the population in order to increase sales). VandeWall et al (1997) conclude from this study that a learning GO leads to higher sales performance mediated by

the aforementioned self-regulation tactics. Performance GO was not found to be associated with sales performance which led the authors to conclude that the assertions of the extant literature were supported, in that those with a performance GO internalise the cause of their task failure and perceive the task outcomes as being related to their unchanging and innate abilities. This leads to high task attrition, which is not seen in high learning GO's where adaptation and ability are believed to be a common feature of tasks and are therefore met with optimism (this is also supported by Seligman and Schulman's work, 1986). As a result of which it could be suggested that this construct may overlap with that of self-efficacy. VandeWalle et al's (1997) findings, in terms of deriving organisational applications from this research, are that organisations should consider selecting for a learning GO as this would have a significant impact upon organisational performance. It is also argued that organisations can influence performance of the workforce by offering appropriate development to those with performance GO preferences and warning is proffered as to the use of practices which may encourage performance GO's to be fostered. They also note that this is particularly important where there is increased complexity in the role, which can be applied to the knowledge work context.

This empirical work offers a useful basis for the study of knowledge workers and is potentially substantial bedrock for the establishment and/or reform of management practices pertaining to these workers. VandeWalle and Cummings (1997) sought to understand the effects of goal orientation on feedback seeking, particularly with regards to individual perceptions of cost and value of feedback seeking. The study combined a longitudinal field study (n = 44) and a scenario study (n= 239), both within the student population. The former study used the GO scale and asked for data about frequency of feedback seeking (from both tutors and colleagues) at two separate stages. The latter study asked employed, part time students to read scenarios depicting a situation where perceived value and cost of feedback are reported on using scales to measure cost, value and willingness to seek feedback alongside GO. The hypotheses, derived from the feedback seeking and GO literature sought to establish relationships between the variables as follows (Fig 5.4).

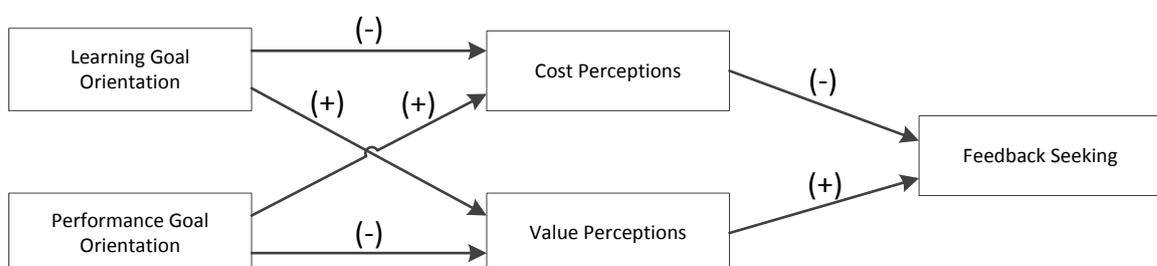


Figure 5.4 Goal orientation and the Feedback Seeking Process

This study also draws from VandeWalle's (1996) work which identified that the avoid GO was more strongly associated with concerns about negative evaluation. In order to explore the model further they calculated a dominant goal orientation score which was the difference between the average score on the avoid/prove scale and the average response on the learning scale. The results of both of the studies demonstrated that goal orientation and feedback seeking were related. The studies served to show that prove and avoid dimension were negatively related to feedback seeking. An interesting outcome of the study was the recognition of an increase in 'likelihood of feedback seeking' in line with the learning GO surpassing the performance GO which VandeWalle and Cummings (1997) suggest supports Dweck and Leggett's (1988) work which noted that 'performance goals become dysfunctional when they dominate learning goals' (p397). The model proposed was substantiated by the empirical work but it demonstrated partial, rather than full mediation by perceived cost and value of feedback seeking which may be more fully accounted for by other factors. This study is acknowledged by the authors to contain some potentially confounding effects relating to the equality of the participants similarity in base levels of ability. The experimental context and cross-sectional aspects of the work were also considered as limitations but not to such a degree as to question the usefulness of the outcomes. The conclusion here, that individual differences relating to GO are influential in determining performance seeking behaviours, is significant in considering the relationship for knowledge workers as part of the hypothesised model. It may be that learning GO overlaps somewhat with GNS in the JCM and it should be of interest to examine the role of the dominant goal orientation as a moderator in the model. It is therefore hypothesised that:

*H8 The moderating effect of growth need strength on the relationship between the core job characteristics and the outcomes of the JCM will be greater for knowledge workers than non-knowledge workers.*

*H9 The moderating effect of a learning goal orientation on the relationship between the job characteristics and the outcomes is greater for knowledge workers than non-knowledge workers.*

The importance of an organisation's acknowledgment of the importance of feedback seeking behaviours is emphasised by Ashford et al (2003) particularly due to the suggestion that there is limited understanding by managers of the work undertaken and due to increased virtual working in the knowledge worker population. Traditional feedback therefore is suggested to be less easily

obtained for knowledge workers due to the nature of the work and the location of the work. Underlying motives (examined by Ashford, 1986) are considered to be paramount to this feedback seeking behaviour which can also be somewhat aligned to goal orientation as part of an instrumental motive for feedback seeking. It could be suggested that feedback is an important facet of knowledge workers organisational interactions which further supports its inclusion in this study.

In order to examine goal orientation further there was recognition, within the interested research community, that the field research should be directed away from the student population toward employees in commercial environments. Steele-Johnson et al (2000) sought to expand upon VandeWalle et al's (1996) research by examining the effects of goal orientation upon task demands. This work is of interest in determining the extent to which task difficulty and skill acquisition effect the various goal orientations, as this may be pertinent to the distinctions which exist between the knowledge worker and non-knowledge worker archetypes. The hypotheses in Steele-Johnson et al's work (2000) are that goal orientation interacts with task difficulty in its relationship with performance, intrinsic motivation and satisfaction with performance. Whilst acknowledging that research in this field should include commercial organisations this study was conducted, once again, using undergraduates as subjects. Whilst this expands the theoretical base it fails to adequately explore the contextual differences whereby subjects may experience different perspectives on the importance of the task in an employment context. The results of the study showed that subjects who reported a higher learning goal orientation reported higher levels of motivation on an inconsistent task. Performance GO was linked to high self-efficacy on a consistent task i.e. benefits were identified with '...a learning GO under high task demands or a performance GO under high task demands' (Steele-Johnson et al, 2000; p734) which could be applied to the type of tasks typically attributed to knowledge work and non-knowledge work (which were discussed in relation to creativity and complexity, particularly heuristic and algorithmic tasks). This offers further support for the hypothesis that knowledge workers will be more likely to have a learning GO as this is congruent with the type of task which is generally perceived as being more heuristic. The knowledge work model could also be tested for relationships between GO, task identity, feedback and intrinsic motivation to assess the interactions between these variables but this goes somewhat beyond scope of this study in deepening knowledge of the constructs rather than of understandings of the difference between these archetypes of knowledge work. Generally Steele-Johnson et al's (2000) research serves to illustrate that simplicity of task yields greater satisfaction for those with a performance GO and complexity elicited satisfaction induced by 'mastery' for learning goal orientation dominant subjects. It is concluded that it is important for organisations to appreciate the

complexity and demand of tasks, individual goal orientation and feedback loops (Ashford et al, 2003) in order to appropriately structure tasks to best effect for the needs of the employee which should yield greatest benefit for the organisation, all of which are imperative to knowledge based organisations (as reinforced by Steele-Johnson et al's (2000) introduction to the domain). As such, GO is considered to be a vital component of the study of the knowledge worker's relationship with their work and their employing organisations.

The literature pertaining to goal orientation has served to demonstrate the empirical foundation for the construct in terms of the three facets of learning, avoiding and proving. It has also established relationship between goal orientation and a range of variables including feedback and task demands. All of these studies construct a picture of this domain with the wide-ranging implication for understanding workers, their approaches to goals, their performance and their development as productive members of organisations. The complexity of tasks and the fit of the individual in terms of their dominant goal orientation is particularly pertinent in furthering our understanding of knowledge workers and the presupposed unique place that they occupy. It is undeniable that the difficulty associated with unobservable tasks combined with complexity in problem solving/creativity and identification as part of the organisation in relation to knowledge work is a feature of the rhetoric which surrounds and indeed (re)constructs knowledge work. It is evident that explorations of goal orientation can give greater insight into the differences that exist within the archetypes through testing of the stated hypotheses and further examination in the later qualitative study.

#### 5.46 Identification

The outcomes of the KWCM are suggested to include, in addition to those in the JCM, community identification and high affective commitment as outcomes of the interaction between the person and the job. Social Identity is described by Tajfel (1981, p292) as '...the individual's knowledge that he belongs to certain social groups together with some emotional and value significance to him of this group membership'. This notion of social identity and identification with a particular group are not prominent within the knowledge work literature and therefore questions were not directly asked relating to this in the exploratory study interviews in Chapter 4. However, there is some discussion with regards to loyalty to the profession and wider networks for knowledge workers in contrast to that of non-knowledge workers who identify more closely with their employing organisation (Depres and Hiltrop, 1995). It is apparent from the interviews that some of the knowledge workers discussions reference the occupation of which they are a part rather than the organisation in which they work. It is suggested that this may be linked to their sense of occupational identity and their sense of being part of the wider IT profession, which transcends the organisation in which they are

located. The very nature of their daily interactions with the Internet and on-line communities suggests a very different context for identity than that which is experienced by other workers, as it reaches beyond the organisations in which they are physically located, via synchronous and asynchronous interactions with others across the world. However, it may be suggested that these interactions are more frequently experienced by the knowledge worker archetype than the non knowledge worker archetype due to the requirements of development work which requires generation of complex ideas.

Much work has been done to develop the empirical base for the concepts of organisational, professional and occupational identification which are derived from constructs explained collectively by social identity theory. This can largely be attributed to the work of Ashforth and Mael (1989) who note that identity has frequently suffered from being conflated with organisational commitment and also organisational citizenship behaviour. It is therefore important to establish the concept of identification clearly and distinctly from similar constructs within the literature, given the themes relating to commitment emerging from Study 1.

Ashforth and Mael's initial proposition with regards to the use of Social Identity Theory (SIT) was made in the *Academy of Management Review* (1989) and was then tested in the empirical work reported in their 1992 study on organisational identification in an all-male religious college (Mael and Ashforth, 1992). The proposed model was derived from a number of observations made from the existing knowledge base relating to the broad concept and SIT. Perhaps the most relevant of those underpinning features to this research project is the discussion of group identification which was described as four principles within the literature. Firstly that the group member '...need only perceive him or herself as psychologically intertwined with the fate of the group' (Ashforth and Mael, 1989; p21) and as such, there does not need to be any actual effort expended towards the group's goals. Secondly, experience of the groups successes and failures were characteristics of group identification. Thirdly, SIT distinguishes between identification and internalisation, with the latter being viewed as unnecessary in order for the former to exist (which will also come under further discussion with regards to the construct of commitment in relation this study). Finally, group identification is noted as being similar to the identification which occurs with an individual in that specific qualities are embodied within the organisational group setting which emulate individual characteristics. Mael and Ashforth (1992) also identify the antecedents of social identity which are suggested to be context, prestige of the group, salience of out-groups and the factors which are generally found to affect group formation such as shared goals, similarities, shared history etc.

Self-categorisation theory (SCT) has also been influential in the development of theories relating to organisational identification. SCT is suggested by Hogg and Terry (2000) as offering a complementary perspective on identity to that which has previously been discussed and which can support further empirical work. The description of Tajfel (1972) pertaining to social identity at the beginning of this section, is built upon further by suggesting that a system of social categorisations “...creates and defines an individual’s own place in society” (cited in Hogg and Terry, 2000; pg 293). These categorisations are reliant upon the determination of in-group and out-group categories (noted in SIT) with the attribution of certain prototypical features to the groups. Prototypes are described here as

“...fuzzy sets that capture the context dependent features of group membership often in the form of exemplary members (actual group members who best embody the group) or ideal types (an abstraction of group features)”

(Hogg and Terry, 2000; p123)

This concept of prototypes and their derivations from ideal types/exemplars resonates with the approach taken in this research design regarding the (non) knowledge worker archetypes but also in considering the role of community websites which act as virtual occupational communities. They are frequently headed up by guru-like figures who have been significant in coalescing discussion in a particular field or who have been responsible for a significant technical development. This would emphasise the need to examine identity within the ‘community’ domain which relates to the identification and group affiliation which emanates from these technical communities. It could be suggested that these groups have superseded the domain of occupational and organisational identity which would be expected within a more traditional workforce. These communities may be representations of in-groups which exist distally, going beyond the reach of organisations and traditional configurations of professional workers (represented by professional associations such as BCS and IEEE). As Hogg and Terry (2000) propose, the context of prototypical groups is highly context dependent and therefore the virtual connectedness experienced by knowledge workers could affect the identification foci for these workers, as opposed to non knowledge workers whose contact with virtual communities is less frequent, pervasive and intrinsic to the task than knowledge workers. Therefore it is hypothesised:

*H10 Knowledge workers will identify more closely with their occupational community than their employing organisation.*

It has also been suggested that occupational identities are being eroded by pervasive organisational cultures and mainstream, homogeneous management practices which herald a 'post-occupational' age (Reveley and McLean, 2008). This observation may be more readily applied, as it is by Reveley and McLean (2008), to occupations such as mining rather than knowledge work, particularly when examining narrative resistance. However, the notion of identity as being a discursive creation may be explored further in Study 3 which seeks to deepen understandings of knowledge work in a way which is more akin to Alvesson's (2004) suggestions regarding the continuous reforming of an individual's identity as being a facet of knowledge work.

Gonzalez and Chakraborty's (2012) study examines organisational identification in non-work organisations (a national professional business association and a business fraternity) in order to establish the relationships between perceived similarity (to the organisation), construed external image (of the organisation) and organisational identification. The authors establish that perceived similarity is motivated by a relational self-definition in contrast to perceived external image appealing to a personal self-definition. The sample of 117 members was surveyed using items from Mael and Ashforth's OID scale (1995), a reputation scale (1992) and a newly developed scale to measure perceived similarity. The results demonstrated that positive external image and perceived similarity to organisational leaders and members is related to OID with one of the findings being that a positive external image encourages member perception of similarity and OID. This research emphasises the need to examine the workers perceptions of identification with the profession/occupation as well as the organisation, team and community. It may also give an insight into the role that non-work organisations (BCS, IEEE) have in shaping the occupational identity of both members and non-members. Gonzales and Chakraborty's (2012) work also raises the question as to whether perceptions and memberships of professional associations and institutes is relevant and appealing to those working in the IT sector, a question which can be explored further in this current study in relation to knowledge workers' foci of identification, the strength of identification and the relative importance placed upon it within the occupational groups.

Multiple identities previously referred to are suggested to be 'activated by situational cues' by Johnson et al (2006 p498) giving the example that one social identity may be enacted at work and a different one be activated in a different social context, for example 'when at lunch with friends'. It could be suggested that this is an over-simplistic observation but is one which is tangible and observable within a more conventional work force who arrive at work, conduct their work and leave with the ringing of the factory bell. For the archetypal knowledge worker the boundaries are

considered to be blurred with social interactions with their occupational and community groups, extraneous to the organisation, taking place whilst working in the organisation with frequent use of the Internet providing a conduit for these interactions both synchronous and asynchronous and relating to the work being undertaken. These interactions with other foci of identification may provide a particular challenge in managing a workforce which moves in and out of the organisation repeatedly throughout the working day, potentially altering the constancy of the relationship between the organisation and the employee. The foci of identity for this group of workers are clear but it could be suggested that these frequent interactions serve to generate a fuzzy identity which confounds traditional views of identification and identity. This may be difficult to pursue fully within the design of the quantitative research study but nonetheless may be explored further in the qualitative study in order to further understand the effect that ongoing extra-organisational interactions have upon identity formation in this occupational group.

As the non-knowledge worker archetypes are less likely to engage in these interactions, due to the nature of their work, it is more likely that they will have a tendency to identify more with proximal groups than distal ones (Ashforth and Johnson, 2001) (terms which are best clarified in terms of physically proximal/distal for non knowledge workers and virtually proximal/distal for knowledge workers). Johnson et al (2006) examined the differences in identification in veterinarians using Mael and Ashforth's (1992) six item scale with job satisfaction as an outcome variable. The findings suggest that veterinarians working in non-veterinary medicine organisations identified more strongly with their work group than with their organisations, that is, the proximal foci were far more influential in terms of identification for this group. This could also give an indication as to how the sector could influence the foci and level of identification for knowledge workers where there are relatively weak organisational attachments due to the strength of demand in the labour market. Johnson et al's research (2006) also indicates that job satisfaction is predicted by all foci of identification with work-group and professional identification is more strongly related to job satisfaction than organisational identification which needs now to be examined further in the 'new' knowledge worker group rather than in long established professional groups which are referred to in the knowledge work literature as belonging to the 'old' classification of knowledge workers alongside doctors, solicitors and clergy (Cortada, 1998).

The preceding research draws attention to the absence of discussion within the knowledge work literature regarding identification with teams/work-groups. This is despite the fact that knowledge work is seen to require higher levels of interdependence and is focused around groups or project

work (Despres and Hiltrop, 1995; EIU, 1998). By contrast the non-knowledge worker archetype is considered to work in greater isolation and the focus of the work is at the individual rather than the team level (Despres and Hiltrop et al; EIU 1998). It is therefore suggested, given the evidence from the archetypes and the literature reviewed here that knowledge workers may identify more strongly with the teams in which they work. It is therefore hypothesised that:

*H11 Knowledge workers will identify more strongly with their team than non-knowledge workers.*

Ashforth et al (2008) continue to build upon extant work in the field by asserting that identification can be conceptualised as a process-oriented model: a fuzzy set (see Fig 5.5 below).

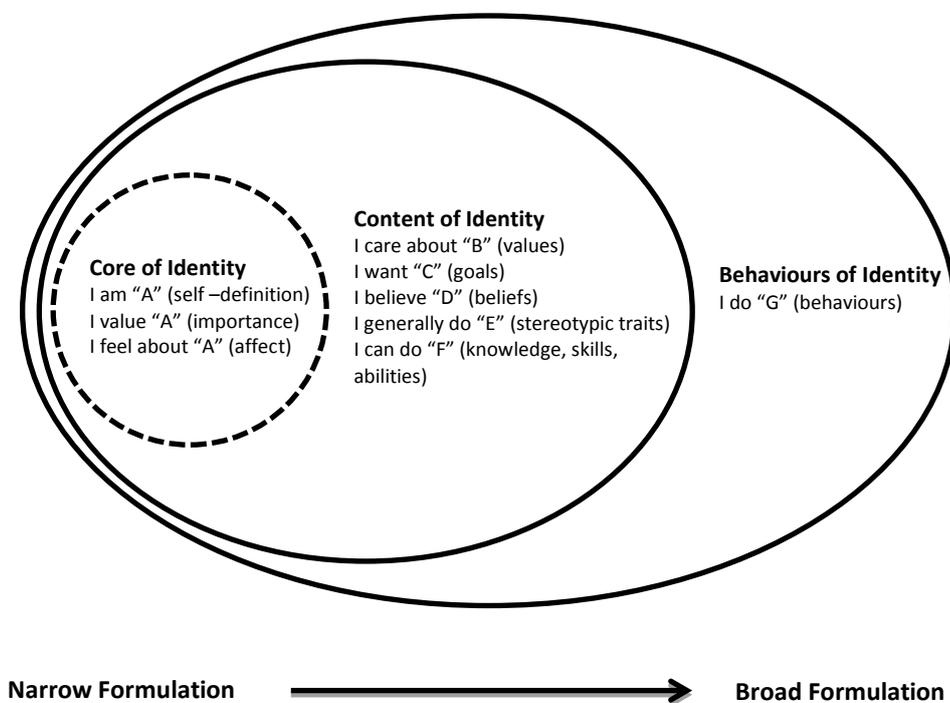


Figure 5.5 Identification: A Fuzzy Set

This model contains the narrower definitions derived from SCT and SIT focusing primarily upon self-concept. It broadens out to the content which is located within the organisation and which moves the 'individual into a prototype of the collective or role' (Ashforth et al, 2008; p330). The broadest ring of behaviours in the model encompasses those such as OCB and in-group bias (which have been empirically tested) but Ashforth et al (2008) recognise that the link between these behaviours (the first two rings: cognitive and affective) may be affected by situational and contextual constraints therefore being seen as a 'probabilistic outcome' rather than a necessary 'component' of the model

(p331). This model provides an insight into identification which can be examined further using the qualitative approaches taken in Study 3 where knowledge workers are invited to articulate their perceptions of identification in relation to various foci.

The concept of identification, its antecedents and outcomes continue to attract attention in empirical work in order to develop, as with many other theoretical models, a more parsimonious model. Boros et al (2011) endeavour to construct such a model which is more positivist than Ashforth et al's (2008) 'fuzzy model'. There is a multidimensional model which attempts to comprehensively differentiate between cognitive, affective and evaluative identification. They argue that these components are often incorrectly conflated or used inappropriately in explaining outcomes. In Ashforth et al's (2008) model the cognitive components are at the core with evaluative and emotional as the identity content. Boras et al (2011) note that much empirical work only includes the affective (emotional) and cognitive aspects with little testing of the evaluative component or the interactions of all three. One area of contention in this domain is the inclusion of affective commitment (AC) as an outcome variable. Some scholars would argue (Mael and Ashforth, 1992) that this is a distinct construct whilst others (Riketta and Van Dick, 2004) suggest that AC provides the motivation for an individual's attachment to the organisation. There is also a suggestion that cognitive and affective aspects of identification and commitment are not comparing like with like. This should therefore be noted when considering the role which identification and commitment play in the Knowledge Worker Characteristics Model proposed in this current study.

With Boros et al's (2011) assertion that commitment and identification have been inappropriately distinguished, further analysis of this overlap should be made in order to establish their relevance to explorations of knowledge work through the outlined model and hypotheses. Riketta and Van Dick (2004) use the term attachment to aggregate affective commitment and identification as they both 'refer to an overlap between an employee's self-image and his or her image of the organisation' (Riketta and Van Dick, 2004 p 491). Riketta (2004) establishes however that these two constructs, whilst related, are distinct ( $r=.78$ ) whilst acknowledging that the distinction between affective organisational commitment and organisation identification 'is the fuzziest one'. The meta-analysis regarding the broader concept of attachment (subsuming affective commitment and identification) demonstrates that employees are more committed and identify more strongly with their work groups than with the broader organisations (similar to reports of identification in the Johnson et al's (2006) veterinarian study). However, this is considered by the authors to be a preliminary test with the need for further examination regarding causality and moderation. This does give greater insight

into the colloquial use of the term work attachment and how it generally represents affective commitment and identification. In order to more adequately examine the key facets of knowledge work and the relationships between the variables for the two archetypes these two constructs will however be viewed separately, particularly given the need for clarity when attempting to draw conclusions as to useful HR practices for these groups.

The scales used in Riketta and van Dick's (2004) study are Mowdays et al's (1979) and Meyer and Allen's (1991) and much of the contention relating to the obfuscation around affective commitment and identification is derived from overlapping scale items. One solution to this issue of overlapping measures is in the use of a scale such as Shamir and Kark's (2010) which is pictorial and therefore doesn't not rely on a statement to capture the response (see Chapter 3). However, it can be asserted that organisational identification (OI) is a cognitive construct thus allowing delineation as it is not linked directly to any affective states or behavioural outcomes (see Ashforth and Mael, 1989; Mael and Ashforth et al, 1995). OI was found by Riketta (2004) to be conceptually different from affective commitment (61% shared variance was still large) and particularly when examining correlates OI was found to be less strongly correlated with job satisfaction than was affective commitment. Also, OI was found to be related to job satisfaction, organisational satisfaction and job involvement but was found to be distinct from them. Riketta (2004) acknowledges that meta-analyses may not be purely assessing and reporting upon distinctions between the constructs but there may be implicit differences in study design and methods which could affect the findings. Even so, there is adequate evidence to suggest that these constructs are sufficiently different in a number of facets to be useful inclusions to the current study of knowledge work.

The domain of IT work has been used to explore identification in a contemporary setting particularly due to characteristics of prevalence of virtual working, pervasiveness of new technology and media, dispersed teams and differences in the labour market conditions (Weisenfeld et al, 1999). What may seem to be relatively low-tech examples in retrospect within Weisenfeld et al's study (advances such as working using laptops, accessing databases, email use and being remotely located) were suggested to be responsible for re-shaping organisations and the social structures within them 'the dispersion and dislocation characterising employment in virtual organisations strain the psychological ties between organisations and their members' which will affect OI. Communication was considered by the authors to be a key mechanism by which these ties can be maintained using formal mechanisms such as performance management and other control mechanisms designed to elicit convergence between organisation and individual which could be used to bridge the gap

generated by digital working through communication media. There is also a suggestion that 'virtual status' should determine the type of communication required, indeed that it moderates the relationship between communication and strength of OID. The study of 276 sales people in an IT company examined their 'virtual status' types and frequency of communication and their OID. Whilst OID was not found to be related to the type of communication used there was evidence that communication creates or sustains OID. The research supports the proposition that interaction (regardless of media used) is essential in generating identification for virtual workers, of whom there are many in IT work. Therefore, this dimension of work in relation to identification should be considered in Study 2 as being worthy of further exploration in both analysis of the statistical data and in the qualitative study of Study 3 as a large proportion of their communication is with professional colleagues outside the organisation.

Marks and Scholarios (2007) studied professional and organisational identities in software workers conducting a survey in five Scottish organisations with a sample of 303 respondents followed by 73 qualitative interviews. The authors measured organisational identification using Allen and Meyer's (1990) affective commitment scale which throws into sharp relief the confusion that surrounds this construct in empirical work. Professional identification was measured using three items to measure normative aspects of behavioural identification. Whilst the study sets out to examine identification by separating the higher skilled and lower skilled types of software work) it could be argued that this study serves to elucidate as to levels of affective commitment experienced in these two groups. It also appears that qualification level was used as proxy for the level of knowledge work as well as the role. The results conclude that the non-IT qualified group (lower skilled/non knowledge worker) reported higher levels of identification with the organisation. With other effects controlled for, age was shown to be most significant in predicting organisational and professional identification. It is suggested that this could be explained by the increased availability of IT specific degree courses to the younger age groups and it may also be explained by the different requirements of older workers in terms of employment conditions. The conflation of organisational identification and affective commitment is extremely unhelpful in determining the level and type of identification. The less well qualified software workers in the organisation may also not experience the same labour market conditions which exist for those who are more skilled where there is high demand and therefore comparison of these groups may be problematic when attributing AC characteristics to those of identification. Given the discussion around differences between cognitive, affective and behavioural facets of identification there is much to suggest that these measures are inadequate in determining a relationship. There are several factors in this study which suggest that there is a significant

difference between knowledge workers and non-knowledge workers in their perceptions of their work. Marks and Scholarios (2007) also demonstrate the difference between profession and organisation as foci of identification with a focus on elite identity (a higher skilled focus on profession) through the quantitative and qualitative work which will be examined further in the current study. Despite the difficulties with the measures employed here the findings support the suggestion that non-knowledge workers identify more strongly with the organisation than with external foci. Therefore it is hypothesised that:

*H12 Non-knowledge workers will identify more closely with their employing organisation than knowledge workers.*

Brooks et al (2011) pursue the issue of IT professional identity further by establishing a firmer theoretical model of identification based in Identity Theory, Social Identity Theory and Social Categorisation Theory with a particular focus upon the organisational benefits (increased retention and performance) of strong organisational identification. Acknowledging the relationship and distinction between organisational and professional identification Brooks et al's (2011) study examines individual factors of need and self-efficacy, internal and external professional factors (including perceptions, uncertainty and similarity to others in the profession based on SCT). Mael and Ashforth's OID scale was used along with validated self-efficacy items, and a professional ID scale was developed and validated. The research identifies that there is a connection between the respondents' need to identify and their level of perceived identification with their profession (although this may be said to be true of any individual rather than specifically these workers) which Weisenfeld et al (2001) term as need for affiliation. There was found to be no significant relationship between self-efficacy and professional identification. From this study perception of the profession and perceived similarity to the profession were found to be significantly related to professional identification. This is somewhat unsurprising but it is used to support the notion that development of the professional identity and attachment can be beneficial for organisations and that employees should encourage participation 'in professional groups such as VB.net user groups, the information Technology Association of America (ITAA)' (Brooks et al, 2001 p96-97). It is not explained why it would be beneficial other than to use conference attendance and membership as a mechanism for acknowledging their performance. However, it could be suggested that stronger identification with the profession erodes the sense of identification with the organisation particularly if the professional group offer more exciting, dynamic and stimulating opportunities outside the organisation. This suggests that the strength of professional identity alongside community identity should be

considered in terms of the extent to which they adequately describe the holistic developer identity which appears to be established through a different set of mechanisms than the traditional professions (which means the established professional bodies, institutes and associations which one would join as an expression of belonging to one's profession). As such it will be of interest to examine the distinctions between and constructions of what is meant by profession and community identity to IT workers themselves, primarily through the qualitative study.

The extant work on identification also indicates that there is a possibility of relationships between variables which are already included in the KW model, specifically those of creativity, autonomy and commitment and other work related attitudes (Riketta and Van Dick, 2005). Whilst Ashforth et al (2008) suggest that identification is best conceptualised as a process they also recognise that the 'top-down' research, as they refer to it, contains some useful indicators as to predictors of identification such as autonomy which is measured as a core job characteristic. This is suggested to imbue a sense of independence, freedom and being 'master of one's own destiny' which then creates/reinforces a particular identity which could be most closely affiliated with self-concept aligned to an identity locus (e.g. the organisation, profession etc). It should also be noted that, whilst there may be a number of positive factors associated with high levels of identification, particularly OID, there may be negative outcomes for the organisation (Ashforth et al, 2008). As previously discussed there may be detrimental organisational effects in nurturing extra-organisational identifications (particularly given the labour market conditions) but strong internal identifications may also be problematic. Haslam (2006) establishes that strong identification may promote unhelpful commitment to underperforming projects for example and concepts such as group-think may be representative of an erosion of creative and innovative practice in line with Rotondi's (1975) observations of an inverse relationship between OID and creative performance which Ashforth et al (2008, p333) term a 'curious finding'. Even so, it should be acknowledged that when identification is examined in relation to other variables the bi-directional nature of many of these interactions renders it difficult at times to establish causality but also to truly establish what the subject is precisely is conceiving their identity to be and how they are articulating this to the researcher.

The inclusion of identification in the KWCM is essential in gaining a deeper and more holistic conceptualisation of knowledge workers and the way that they relate to organisations, and perceive of organisational life. The hypothesis relating to this concept attempts to determine differences and similarities which exist between knowledge workers and non-knowledge workers in order to more

fully understand the impact of identity and identification for organisations and the HR practices which they employ in relation these groups.

#### 5.47 Commitment

The commitment of knowledge workers is of particular concern when considering the relationship between the worker and the organisation and the types of practices employed in an effort to manage these workers. This theme emerged strongly from the prior literature and data analysis of the exploratory study. Knowledge workers, particularly in the hi-tech industries are seen to have '...considerable choice and latitude regarding their place of work and therefore management needs to find ways of retaining an expert workforce' Newell et al (2002 p 24). The conditions of the labour market, in terms of low supply and high demand for software developers (dependent upon programming skills), has meant that these workers have occupied a privileged position with the availability of opportunities for movement at will. Of course, this situation fluctuates slightly according to the general economic conditions but the skills gap still remains (Sambell, 2007) and affords developers the opportunity of high mobility. This environmental factor can explain some of the influences which could lead to the low organisational commitment of knowledge workers. However, there is evidence to suggest within the literature that this outcome may not be as expected. Therefore, the literature is reviewed relating to this construct and an examination of studies carried out within IT is undertaken.

Discussions of commitment have traditionally taken either an attitudinal (Buchanan, 1974, Steers 1977 cited in Meyer and Allen, 1997) or behavioural perspective (Kiesler, 1971, Salancik, 1977 cited in Meyer and Allen, 1997). From an attitudinal perspective commitment can be viewed as 'the relative strength of an individual's identification with and involvement in a particular organisation' (Oliver 1990, p19). This perspective suggests that individual factors and organisational factors can affect workers levels of emotional attachment to organisations. One of the earlier measures of commitment was the Organizational Commitment Questionnaire (Mowday et al, 1979 cited in Arnold, 2005) which has now been determined to predominantly measure one aspect of commitment - affective commitment (Arnold, 2005). Behavioural approaches are primarily concerned with examining how subjects commit to a particular course of action which then develops into an attitude or a psychological state (Meyer and Allen, 1997). The psychological contract view of commitment is also one which has received much attention particularly in seeking to explore the construct in the context of changing labour relations (Linstead et al, 2009). However it is felt that this

is a problematic approach due to the inherent difficulties in explicating both parties' views of what constitutes the psychological contract.

Whilst traditional models of commitment focus upon the organisation as the primary foci there has been an increasing body of work which recognises the changing nature of work and the organising of work (see Chapter 1). It is suggested that post-bureaucratic, boundaryless environments where multiple relationships (internal and external) are constituent parts of the work context require that commitment should be re-examined to reflect other potential foci of commitment (Reichers, 1985). Internal foci which have been examined additionally in recent studies are management (senior and line), team members and colleagues (Becker, 2009; Reichers, 1985; Becker, 1992) with external foci (extending beyond the boundary of the firm) of professions/occupations (Raelin, 1991; Wallace, 1993) and clients (Coyle-Shapiro et al, 2006; Swart and Kinnie, 2003, Kinnie and Swart, 2012; Stinglhamber et al (2002). Reichers (1986) initial study of several foci identified, in a sample of 124 mental health professionals, that there was evidence for varying commitment levels existing between foci. However, organisational commitment was only found to be correlated with top management goals and they were found to be less committed to the organisation if there was felt to be conflict with the other foci and those of management. Becker (1992) also found that commitment to senior management, line-manager and their work groups made a greater contribution to turnover intention than did organisational commitment although there were also strong correlations between global commitment and turnover intention. The notion of local and global commitment foci as predictors of turnover were developed into commitment profiles with those who are committed locally and globally being found to be the most likely to remain in the organisation. However, there are some difficulties which occur with multiple foci studies which use turnover intention as an outcome variable in that an understanding of the impact upon a broader range of attitudes is not assessed.

The extension of theoretical work into examinations of multiple foci of commitment is an important one which acknowledges the complexity of organisations and the permeable nature of the organisational boundary within the post-industrial context. However, there are some issues to be resolved whereby the concept of identification, identifying with various foci and associated goals or values may be overlapping with the concept of commitment in relation to these foci. As previously noted the constructs of ID and commitment have received much attention due to assertion that these constructs are conflated (Riketta and Van Dick (2004); Boros et al, 2011). Models of multiple foci of commitment demonstrate that there are issues about where the commitment is directed but

this is still relatively difficult to unravel given the complexities of new organisational forms. Distinctions between these relationships may be difficult to determine and separate out considering the difficulties of having clients as managers and project teams comprised of multiple organisational members (Swart and Kinnie, 2004). It should also be stated that recent work relating to commitment has seen the increased use of commitment profiles where data is combined to create a profile (Meyer et al, 2012). However, research suggests that commitment profiles can be seen to alter over time and this should be considered when constructing a cross-sectional study (Bentein et al, 2005). It is interesting to note that whilst the multiple foci model has come to the fore much of the work on commitment profiling still uses the three component model (Meyer and Allen, 1997) to measure the constructs (Meyer and Herscovitch, 2001; Somers, 2009,2010; Meyer et al, 2012)

Whilst it may be considered to be lacking in sophistication to fail to measure multiple foci and address the complexities of contemporary organising for work, in order to attain clarity in measuring and differentiating between the variables of identification and commitment in this study it was considered appropriate to utilise the three factor model. This ensured that organisational commitment was retained as the single focus with identification established as a separate variable. As the notion of organisation is seen in this thesis in pragmatic bounded terms according to Cappelli and Keller's classification (2013b) it is useful to adopt a measure or constant that recognises this whilst also acknowledging that the notion of what an organisation is may be scrutinised and deconstructed. It is suggested therefore that use of the three factor model is most appropriate in pursuing the interests of this programme of research. Meyer and Allen (1997) raise questions about focus of commitment and the multi-dimensional nature of the construct which is pertinent to questions about the nature of knowledge workers' commitment to organisations. This model, which was developed through extensive work on the literature and empirical testing, comprises of affective, continuance and normative commitment. Affective commitment, as outlined previously, relates to the level of emotional attachment that an individual has for the organisation. There is a large body of work relating to the antecedents of this type of commitment which are divided by Meyer and Allen (1997) into organisational characteristics, person characteristics and work experiences. The strongest correlations in empirical work relating to affective commitment are with work experiences which relate to job characteristics. Strong correlations have been found with affective commitment and job challenge, degree of autonomy and skill variety (Meyer and Allen, 1997). Therefore, inclusion of this variable into the theoretical framework with the aforementioned JCM is considered appropriate for further exploration of Knowledge Workers. Also the overlap with the identification variable suggests that it warrants further analysis. The second component of the

model, continuance commitment, relates to the 'employee's awareness of the costs associated with leaving the organisation' (Meyer and Allen, 1997; p56). In Meyer and Allen's model there are two sets of antecedent variables of investments and alternatives. The former can also be termed as 'side-bets' (Becker, 1960 cited in Linstead et al, 2009) or something that has value which would be lost if the individual discontinues a particular course of action. The latter is viable employment alternatives that are available to the individual and as mentioned previously the nature of the employment market for software developers has presented a wide range of alternatives to this group which may impact upon continuance commitment. The extent to which knowledge workers perceive value in the range of employment benefits presented to them by organisations is yet to be determined. Normative commitment can be described as being 'a moral dimension' (Meyer and Allen cited in Arnold, 2005) linked to an individual's sense of obligation to the organisation. This is perhaps the weakest aspect of the model in that there is the least convincing body of empirical work to support this compared to the other components. Meyer and Allen (1997) suggest that antecedents to normative commitment are socialisation (early formative and organisational experiences), organisational investment and the psychological contract.

Whilst the three-component model is felt to best fit the requirements of this research project it is acknowledged that it has limitations, such as those outlined with regards to normative commitment. Meyer and Allen (1997) acknowledge that commitment is a multidimensional construct of both form (affective, continuance and normative) and focus in terms of an individual's commitment to groups/individuals within the organisation. The author is therefore mindful of the connection here to the knowledge workers' focus of identification and competing demands for affiliation, particularly considering their relationships with their profession and affiliations within software development communities (both virtual and physical). This may give further insight into the findings from WERS 2004 where ICT workers were found to show relatively low rates of loyalty to the organisation and job satisfaction in comparison with other occupational groups (Rose, 2007). Given the attention paid to commitment within the knowledge work literature it is unsurprising that there are several empirical studies focusing specifically upon this variable which specifically use knowledge workers as subjects. Therefore, these studies are examined in order to establish greater understanding of the relationship between knowledge workers and non knowledge workers and their organisations. As the subjects differ in each study, in terms of the specification of knowledge work, a brief description of the context is given in each case.

Tam et al's (2002) empirical work examines knowledge workers commitment in the context of a market model and a proposed dualistic model of knowledge work using financial service and IT workers as the subjects for their study. The market model is based upon Reed's (1996) work which describes knowledge workers strategic approach to marketizing their skills and knowledge in such a way as to strengthen their position as being highly autonomous, highly mobile and as being supra-organisational workers who are focused on the external labour market. This view is argued by Tam et al (2002) to be limited as it assumes that knowledge workers are employed in small organisations or that they display highly entrepreneurial patterns of work. They therefore located their study in large organisations in order to investigate the impact of management strategy on knowledge workers relationships with organisations. They propose a dualistic model which suggests that an organisational form exists whereby management establish enclaves within organisations who enable the specific and unique demands of knowledge workers to be met in an otherwise unsuitable organisational culture. This model also underpins a number of research propositions which explore knowledge workers commitment to occupations and organisations (due to expertise being derived from organisational/contextual and occupation specific theoretical knowledge), the strength of this relationship and also outcomes relating to work effort and job satisfaction. The results of the study demonstrated that respondents reported greater commitment to their occupation than to their employing organisation. It should be noted that this is derived from calculating the mean for the organisational commitment scale and the occupational commitment scale and noting the difference (means were 3.81 and 4.24 respectively). It could be argued that these scales do not necessarily measure similar types of commitment for both foci with only three items measuring occupational commitment and four measuring organisational commitment thereby ignoring the three dimensions advocated by Meyer and Allen (1997), although analysis did suggest that the two factors were present as expected. With regards to the outcomes of discretionary work effort and overall job satisfaction, there was evidence to suggest that occupational commitment was positively and significantly related to both of these outcomes. It was also found that organisational commitment was not significant in relation to discretionary work effort whereas overall job satisfaction was found to make a positive contribution to occupational commitment, organisational commitment and satisfaction, which is as one would expect. Therefore, the authors conclude that occupational commitment and pay satisfaction were primary contributors to the reported overall satisfaction. Organisational commitment was found to be significant and positively related to job satisfaction and results demonstrated a weak positive relationship between organisational commitment and occupational commitment. It is difficult to determine the extent to which these findings relate to genuine organisational commitment or team commitment as the difference is not measured here.

Similarly, it could be argued that there is a bi-directional relationship between commitment and job satisfaction rather than the former necessarily being an antecedent of the latter. This study, whilst seeking to explore a dualistic model rather than a market model of the knowledge work domain does so in a way which demands further analysis of the relationship between organisation, occupation, identification and outcome variables. If the responses were analysed according to organisational context there may also be an interesting contextual aspect to the findings, although it may be that the samples would be too small to support this level of analysis. Indeed, the authors call for further work to be undertaken within IT settings which affirms the eligibility of the occupational archetypes as being representative of knowledge work(ers). Tam et al's (2002) study confirms the relevance and importance of commitment to understandings of knowledge workers relationships with organisations.

Benson and Brown (2007) identified that organisational commitment is of import in determining appropriate HR strategies and practices for knowledge workers, particularly in considering how these may differ from 'routine task workers'. This empirical work addresses two key issues, firstly that which relates to the differences in levels of commitment between these two groups and secondly to determine whether there are any variations in the antecedents of the aforementioned groups. It was hypothesised that knowledge workers would have lower attitudinal commitment, higher intention to quit and lower behavioural commitment than routine workers (derived from Benson and Brown's (2007) literature review of knowledge work and representative occupational groups) and also that the work organisational factors of role ambiguity, role conflict, co-worker support and superior support would be more significant for knowledge workers than routine workers in determining attitudinal and behavioural commitment. The study was conducted in a large, government funded, scientific research organisation in Australia with a sample of 3335 employees (from a population of 6975 employees). The extent to which a worker was considered to be engaged in knowledge work was determined by a ten item scale measuring repetitiveness, reliance on others and influence over the work where scores of 3.92 and above were classified as being knowledge workers (0.5 SD above the mean, N=920) and 3.40 and below as routine task workers (0.5 SD above the mean, N=1049). The analysis showed that knowledge workers had significantly higher attitudinal commitment and lower intention to quit than the routine task workers. In terms of the work organisation factors it was apparent that role ambiguity and supervisor support were significant in determining attitudinal commitment for both groups, with co-worker support also being significant only within the knowledge worker group. With regards to the general explanatory power of the model in terms of attitudinal and behavioural commitment this was found to be greater for routine

workers than for knowledge workers. Benson and Brown (2007) provide empirical evidence to suggest that knowledge workers, according to their measures, have significantly higher attitudinal commitment and lower intention to quit than routine workers. They suggest that this underpins the link between job and organisational commitment although they do note that intention to quit is reflective of the labour market conditions. Knowledge workers commitment levels were also found to be more strongly affected by supervisor and co-worker relationships than the routine workers were. Whilst this evidence is demonstrative of the importance of greater managerial attentiveness to the work design and relationships, it is highly individually specific due to the determination of knowledge work through the self-report measure. It would be of interest to examine whether the knowledge work responses could be clustered into particular teams or occupations within the organisations for ease of operationalising pertinent HR strategies. In order to examine these findings more widely Benson and Brown (2007) call for further study in privately funded organisations, across a broad range of sectors, with further analysis regarding knowledge worker attitudes. The current research study endeavours to address these points with a wider sample of workers representing a broad range of organisational contexts attending to issues derived from the literature review and the exploratory study, by using the three factor model in a broader population of archetypal (non) knowledge workers. Given the results from this study and from Meyer and Allen (1997) regarding links to autonomy, job challenge and skill variety it is hypothesised as follows:

*H13 Knowledge workers will report higher levels of affective commitment to the organisation than non-knowledge workers.*

Whilst the construction of the KWCM is now complete it is of interest to examine two further studies in relation to commitment and knowledge workers. These studies focus upon the HR implications specifically and will therefore be of greater concern when considering the findings from the qualitative study which examine knowledge worker perceptions of people management practices.

Baldry et al (2005) question some of the assumptions made about the meaning of commitment for conceptualisations of HR in the context of knowledge work, specifically with regards to high commitment work systems (HCWS). The study of software developers from five case-study organisations comprised of a survey (N=328) and interviews (N=80) (primarily reporting on the latter data in this paper) with particular focus upon commitment and predominant HR practices. The authors suggested that there is a need to support knowledge workers through HCWS, designed to be congruent with a highly autonomous, intrinsically motivated workforce as evidenced in the literature.

Baldry et al's (2005) study casts doubt as to the existence of these practices in organisations which could explain their findings of relatively low affective commitment. Baldry et al (2005) identified that Beta (one of the larger organisations) demonstrated lower AC than the smaller organisations in the study which had fewer formal HR policies and practices. The foci of commitment here were also called into question, with results suggesting that commitment to the occupation and to colleagues were strongest. Continuance commitment was attributed to perceptibly buoyant demand in the labour market. The use of any 'type' without a contrasting 'other' can lead to difficulties whereby observations are incorrectly attributed to the workers rather than to the context in which they work. It is perhaps of greatest interest in expanding understandings of knowledge workers to consider the importance of the identification foci of the workers in order to more comprehensively assess the importance of organisational commitment in shaping HR practices.

Purcell et al's (2009) work gives further insight into the contribution of job satisfaction and commitment in shaping HR strategies for managing knowledge workers. As identified in Chapter 2 the notion of commitment in relation to organisations with knowledge workers is deemed to be a keystone for the formation of practices linked to performance. It is interesting to note that Purcell's work also emphasises, alongside Baldry et al (2005) that social context and development of professional identity are of import in understanding and developing appropriate HR provision for knowledge workers in organisations (thus reinforcing the appropriateness of the inclusion of identification and relevant foci in the theoretical model). Purcell et al (2009) use data derived from WERS in order to examine the antecedents and impact of affective commitment which, in the HR performance causal chain model, feeds into employee behaviour (measured as discretion) and then into performance. The conceptualisation of knowledge work(ers) is established by Purcell et al (2009) clearly here, as is the context in which the subjects are located and the pertinent HR practices. It is with this in mind that the study focuses upon the individual employee with the outcome variable being affective commitment (measured using a 3 item scale used in WERS 1998) supplemented with qualitative case-based data (21 organisations). The subjects were categorised according to the SOC (2000) whereby the more detailed analysis focuses upon professional and associate professionals. The study examines the relationships between broad categories of social support, training, job design and job satisfaction and affective commitment in these two groups in order to establish the impact of HR practices upon reported affective commitment. Significant relationships were found between trust in managers and affective commitment for both professional and associate professionals ( $b=0.162$  \*\* and  $b=0.173$ \*\* respectively). This was also supported by the qualitative evidence detailing the importance of interpersonal relationships and trust in choosing to join the organisation

as well as in ongoing, felt commitment to the organisation and to career development. Job challenge had a significant relationship with AC for professionals ( $b=.116^*$ ) and associate professionals ( $b=.104^*$ ) suggesting that knowledge workers' commitment is related to problem solving and innovation opportunities within the work. It is also connected to the relationship between goal orientation, intrinsic motivation and job satisfaction already discussed. Purcell et al (2009) also identify a significant relationship between autonomy and affective commitment ( $b=.567^*$ ) which demonstrate a high proportion of variance in affective commitment which is accounted for by this facet of the job. This is consistently reported in the knowledge work literature as being characteristic of knowledge work and something which knowledge workers expect to experience as part of their jobs, which was apparent from results reported in Study 1. This was further supported in Purcell et al's (2009) interview data describing the freedom, choice and individual control present in the professional knowledge workers roles. According to the authors' explication of knowledge work '...they not only want influence over how they apply their skills...they also want to have autonomy over what they do' (p140). Job satisfaction is frequently associated with affective commitment and has been found in this study to be related to affective commitment for professionals ( $b=.1116^*$ ) and associate professionals ( $b=.2444^*$ ) when expressed as satisfaction relating to pay received. Satisfaction with the work itself explained a higher proportion of variance in AC ( $b=.436^*$  for professionals and  $b=.537^*$  for associate professionals) which also reflects the needs of knowledge workers with regards to intrinsic motivation derived from the work, autonomy and professional identity. The latter is evident in Purcell et al's (2009) interview data reflecting the import of these variables for knowledge worker identity, job design and organisational outputs. This study acknowledges that the independent variables of autonomy and satisfaction with the work itself were of greatest relevance to understanding the role which HR practices play in organisations for PKWs in generating organisational commitment. It should be said that the locus of both of these variables is suggested to be external to the organisation as a facet of professional working, with loyalty and identification focused upon the profession. This is an observation which can be evaluated further in the current study by analyses of the differences between knowledge workers and non-knowledge workers in levels of affective commitment and also in establishing the predominant foci of identification. Purcell et al (2009) give great insight into the variables which are significant when considering the use of HR practices and interventions in eliciting higher affective commitment. It may also be suggested that the use of 'profession' as a determining feature of knowledge work could be problematic due to the relatively low levels of affiliation with professional organisations in IT work, possibly inked to the relative immaturity of the industry. It would have been of interest in Purcell's study to consider further the levels of interaction between the variables in accounting for affective

commitment. The greater level of specificity in employing archetypes within the IT domain is anticipated to contribute through the quantitative and qualitative studies to conceptualisations of knowledge workers and in doing so to elucidate as to the HR practices which are perceived to benefit and erode commitment to organisations.

## 5.5 Conclusion

This chapter began with presentation of the archetypes which were established as software developers and database/network administrators after application of the occupational classification data. The occupational classification method is detailed in Chapter 3 and was used in order to define a knowledge worker archetype and provide a non-knowledge worker occupation to act as a counterpoint for discussion (and hypotheses development) akin to the contrasting groups such as the routine work/traditional work oppositions established in the knowledge work literature vignettes of the archetypal characteristics of the knowledge worker and non-knowledge worker occupational archetypes are presented in order to support the establishment of the hypotheses in relation to the theoretical model. The discussion of the KWCM presented literature relating to the key variables and hypotheses which have been proposed relating to the testing of the model in relation to the established archetypes.

In the development of the archetypes (through the literature review, the exploratory study and occupational classification application) a number of prominent themes arose relating to the work and to the characteristics of the worker. These themes strongly resembled the construction of the JCM and therefore it was considered appropriate to use this well established model as the core of the KWCM. Additional variables of creativity, goal orientation, commitment and identification, derived from aforementioned process, were introduced into the model according to the literature and Study 1 findings. Hypotheses relating to differences between the two archetypes (software developer and database/network administrator) were presented in relation to the core job characteristics, whereby hypotheses were proposed to test all variables with the exception of task identity. Creativity was also included as one of the core job characteristics. This was examined with a particular emphasis upon problem solving and was found to be best represented by the concept of creative process engagement. Proposed differences were highlighted with regards to the archetypes engagement in problem identification, information searching and idea generation. Variables of goal orientation and growth need strength were identified as being significant in this model given that archetypal knowledge workers are suggested to require constant opportunities for growth and development. Whilst goal orientation is subdivided into learning, prove and avoid orientations only the learning

goal orientation was considered to be identifiably different within the archetypes. This was suggested to act as a moderator in the model, much as growth need strength does in the JCM. The outcome variables within the JCM were supplemented with affective commitment and identification due to their prominence within the archetypes. Whilst these two constructs are often conflated there was sufficient difference discerned within the literature to suggest that they should be treated separately. Consideration was given to use of the multiple foci model of commitment but the extent to which this conceptualisation overlaps with identification was thought to be detrimental to clarity in establishing and testing this theoretical framework. The evidence from the literature and Study 1 suggests that these workers identify more strongly with their occupational communities than with the organisation in which they are employed. Whilst commitment was considered to be a significant outcome variable within the general literature relating to knowledge work, there was nothing to suggest how this differed from non-knowledge workers. It was suggested however from the findings of Benson and Brown, (2007) that knowledge workers have lower affective commitment than non-knowledge workers and therefore this hypothesis will be tested in the forthcoming study. Hypotheses have therefore been established in order to test the relationships within the model and to elucidate as to the differences between the two archetypes.

This chapter details the establishment of the occupational archetypes of software developer and database/network administrator, and development of the theoretical model comprising of the JCM and commitment, identification, goal orientation and creativity variables. The hypotheses were established in response to the literature reviewed and the exploratory study findings to examine the relationships between these variables in the KWCM. Chapter 6 now details how the occupational archetypes were further granulated through a cluster analysis using the O\*NET occupational classification data to become two knowledge worker archetypes. In Chapter 6 the archetypes are presented in the context of related occupational literature building upon the literature presented in this chapter in relation to the key variables and new hypotheses are established to accommodate the refinement of the archetypes.

## Chapter 6 Redefining the Archetypes and Reconceptualising the KWCM

### 6.1 Introduction

The previous chapter detailed the initial archetypal occupations derived from the application of the O\*NET occupational framework to the knowledge work variables derived from the literature and Study 1. The theoretical framework detailed the literature relating to the key variables used in the KWCM which were similarly derived from prior study. This chapter details the redefinition of the archetypes, reconceptualisation of the theoretical framework and the related hypotheses. However, much of the relevance of the literature reviewed in Chapter 5, pertaining to the key variables of the KWCM, remains despite the granulation of the archetypes and reconceptualisation detailed here. The focus of the thesis therefore shifts from use of a non-knowledge worker archetype, to counterpoint discussions of knowledge work, to two refined knowledge worker archetypes.

After the data was collected from the global study detailed in Chapter 3 it was apparent that there were few responses from the non-knowledge worker occupational archetype of database/network administrators. This lack of data prompted a review of the occupational archetypes through the use of the O\*NET occupational categories and the knowledge work variables. A cluster analysis was used in order to apply a more sensitive method to the data and the results provided an unexpected differentiation in software development occupations granulating down into the archetypal occupations of programmers and web developers. This differentiation meant that the theoretical framework and hypotheses needed to be reviewed to consider matters of difference between knowledge worker archetypes. The archetypes were thus established by reviewing literature relating to the occupational types and amendments made to the KWCM to reconceptualise the nature of the relationships between the variables for the differentiated archetypes. The cluster analysis, redefined archetypes, reconceptualised framework and related hypotheses are therefore detailed in this chapter building upon the literature relating to the key theoretical concepts relating to the variables presented in Chapter 5.

### 6.2 Refining the archetype

In order to accurately categorise occupations using the O\*NET categories, the respondents were asked to state their job titles and also to describe their roles, which allowed a more accurate depiction of the type of work that they did. The responses were then assessed by the researcher and subsequently by an IT expert who examined, for accuracy, the categories to which the responses had been assigned. Thus, all cases were assigned to an O\*NET category (numbered 1 to 12) with the

additional occupations of Education and Training and Project Manager added to reflect all responses. The descriptive data is outlined below in Table 6.1.

	Frequency	Percent	Valid Percent	Cumulative Percent
Computer Software Engineers (Systems software)	83	15.9	16.4	16.4
Computer Software Engineers (Applications)	71	13.6	14.1	30.5
Computer programmers	106	20.3	21.0	51.5
Software Quality Assurance Engineers and Testers	7	1.3	1.4	52.9
Network Systems and Data communications Analysts	4	.8	.8	53.7
Computer Systems Analysts	9	1.7	1.8	55.4
Computer and Information Scientists Research	1	.2	.2	55.6
Computer Support Specialists	14	2.7	2.8	58.4
Web Developers	162	31.1	32.1	90.5
Computer Systems Engineers/Architects	4	.8	.8	91.3
Network and Computer Systems Administrators	7	1.3	1.4	92.7
Computer and Information Systems Managers	31	6.0	6.1	98.8
Project Manager	3	.6	.6	99.4
IT Education and Training	3	.6	.6	100.0
Total	505	96.9	100.0	
Missing	16	3.1		
Total	521	100		

Table 6.1 O\*NET category classification

The refinement of the archetypes presented at the beginning of Chapter 5 saw the use of occupational classification data (detailed in Chapter 3) in order to consider occupations as part of the construction of the archetypes. Using the method stated in Chapter 3 the occupational analysis of the SOC and O\*NET data established that software developers could be considered to be archetypal knowledge workers and database/network administrators and support specialists as non-knowledge workers. After collecting the data and classifying the cases in the sample according to occupation it

became apparent that the sample for non-knowledge workers was extremely low with only 11 respondents from 505 being classified as non-knowledge workers archetypes. In order to address this issue a cluster analysis was used in order to better analyse the sample according to occupational classification.

Twelve O\*NET occupations were included in the analysis which are detailed in Table 6.2. The research specialist category was removed as there was only one respondent, and managers were also removed from the list. The variables most closely associated with definitions of knowledge work detailed in Chapter 3 were selected from the classification system and included in the analysis (see Table 6.3).

Occupation Key	Occupation Title
1	Computer Software Engineers (Systems software)
2	Computer Software Engineers (Applications)
3	Computer programmers
4	Software Quality Assurance Engineers and Tester
5	Network Systems and Data communications Analysts
6	Computer Systems Analysts
7	Computer Support Specialists
8	Web Developers
9	Computer Systems Engineers/Architects
10	Database Administrators
11	Network and Computer Systems Administrators
12	Computer Hardware Engineers

Table 6.2 O\*NET occupations

O*NET knowledge work variables
Complex Problem Solving
Critical Thinking
Judgment and Decision making
Problem sensitivity
Deductive Reasoning
Inductive Reasoning
Fluency of ideas
Originality
Making Decisions and Solving Problems
Independence
Innovation
Analytical Thinking
Investigative
Updating and using relevant knowledge
Thinking Creatively

Table 6.3 O\*NET knowledge work variables

It was anticipated that the analysis would provide a clear indication as to which occupations were more closely aligned with each other in terms of their similarity in relation to the O\*NET knowledge work variables. It was expected that these variables would then give a broader non-knowledge work category. However, the results were not as anticipated as the cluster analysis suggested an anomaly in the knowledge work category whereby web development was not clustering together with the other software development occupations as expected. This can be seen from the agglomeration schedule (Table 6.4) and the dendrogram of the average linkage cluster analysis (Fig 6.1).

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	2	9	568.000	0	0	5
2	4	5	665.000	0	0	6
3	1	3	697.000	0	0	7
4	7	10	921.000	0	0	9
5	2	6	956.000	1	0	7
6	4	8	1267.500	2	0	8
7	1	2	1342.833	3	5	10
8	4	11	1388.333	6	0	9
9	4	7	1510.500	8	4	11
10	1	12	2044.600	7	0	11
11	1	4	2347.278	10	9	0

Table 6.4 Agglomeration schedule

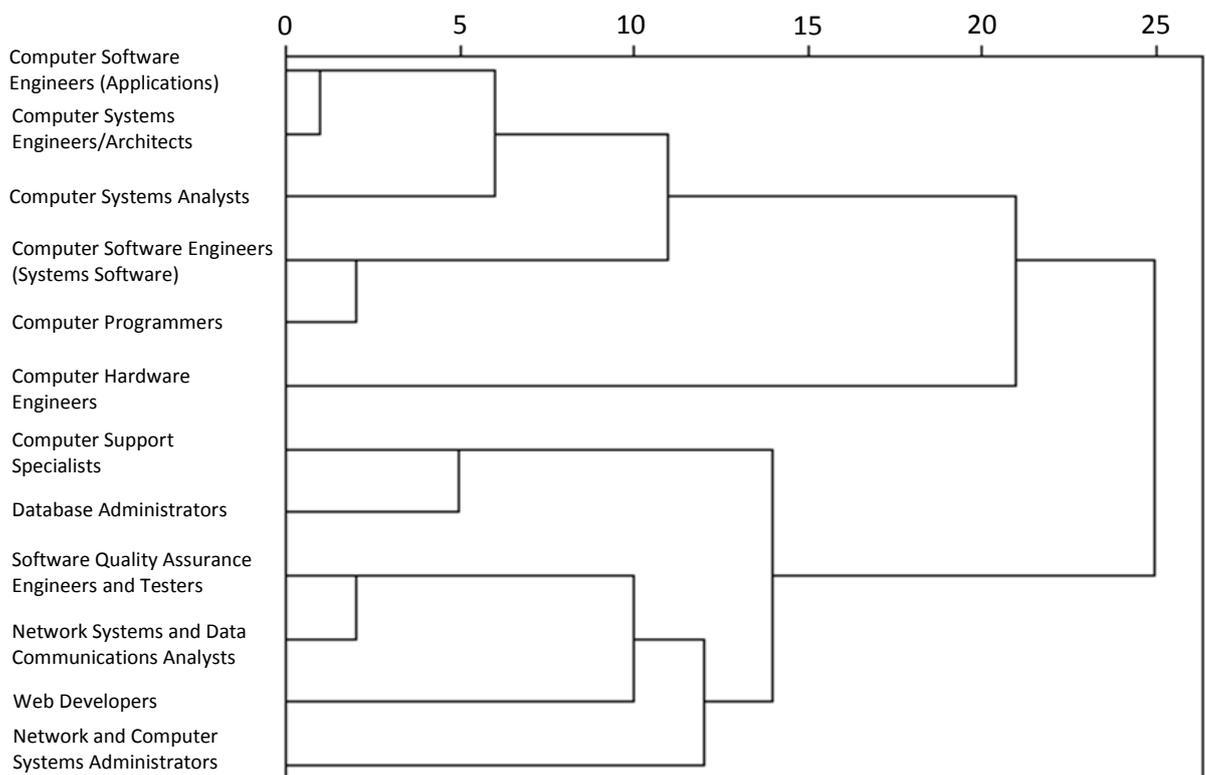


Figure 6.1 Dendrogram of the average linkage cluster analysis

The cluster analysis demonstrated that web developers are clustered, according to the knowledge work variables which have been scored objectively using the O\*NET system, with the occupations of Software Quality Assurance Engineers and Testers (Occupation 4) and Network Systems and Data communications Analysts (Occupation 5) in the first stage and then with Network and Computer

Systems Administrators (Occupation 11) in the next stage. This suggests therefore that the view of archetypal knowledge workers as software developers, in contrast to non-knowledge workers, is an inadequate and insufficient differentiation. Web developers, according to many of the knowledge work studies and IT sector studies, are frequently subsumed into the software development category with the other roles (software engineers (apps), software programmers). It could therefore be suggested that the empirical work which has attempted to examine knowledge work by using this categorisation, and by broadly examining software developers and software development, does not allow for the fact that the occupation as a whole, whilst relatively new, has already differentiated in such a way that to use software development or IT work as a proxy for knowledge work (and therefore as a suitable unit of analysis) belies the complexity and granulation that has already taken place within the occupation.

In light of this finding it could be suggested that, if the context is broadly determined as knowledge work, that there are finer seams of employee experience to be mined in terms of the distinctions which exist even within this narrower conceptualisation of knowledge work. It could be suggested that the Standard Occupational Classification (SOC) categories, whilst seeming overly simplistic when attempting to differentiate between all IT occupations, are most appropriate in acknowledging the differences between Programmers and Software Development Professionals, and between Web Design and Development Professionals. It is therefore proposed that the broad observations pertaining to knowledge work(ers) in the extant literature regarding their work, their characteristics and the differences in how they should be managed, remain too much of an abstraction to be truly meaningful to further this discussion. In order to fully understand newer occupations, which have taken on the mantle of knowledge work, greater analysis should take place using more specific units of analysis. Whilst the broad terminology of knowledge work has served as an heuristic for an interesting debate around the new professions and the differences which have been evident within the knowledge economy/ knowledge intensive settings it could be suggested that this terminology has taken on a life of its own. Consequently attention has been drawn away from the need for fine grained analysis so as to retain a broad discourse of the differences and similarities to be found in relation to traditional or routine work. As all of the aforementioned roles can be subsumed within the terminology of software development it is proposed that a more helpful delineation between web development and other software development is established by using the terminology of programmers and web developers, thereby replacing the forgoing archetypes as units of analysis with these archetypes. 'Archetype' is still felt to be relevant terminology here as the unit of analysis is not specific to a particular job, it is a broader classification that is used as a proxy for those workers

whose roles fit most appropriately into that category, as there are a variety of job roles within these classifications which can be seen from the 'other titles' included in the SOC and O\*NET data.

The discussion continues focusing wholly upon the differentiated knowledge workers archetype rather than using the counterpoint of the non-knowledge worker to further the analysis (the archetype development model presented in Chapter 3 Fig 3.2, shown below is a useful reference to review the process of development to this point).

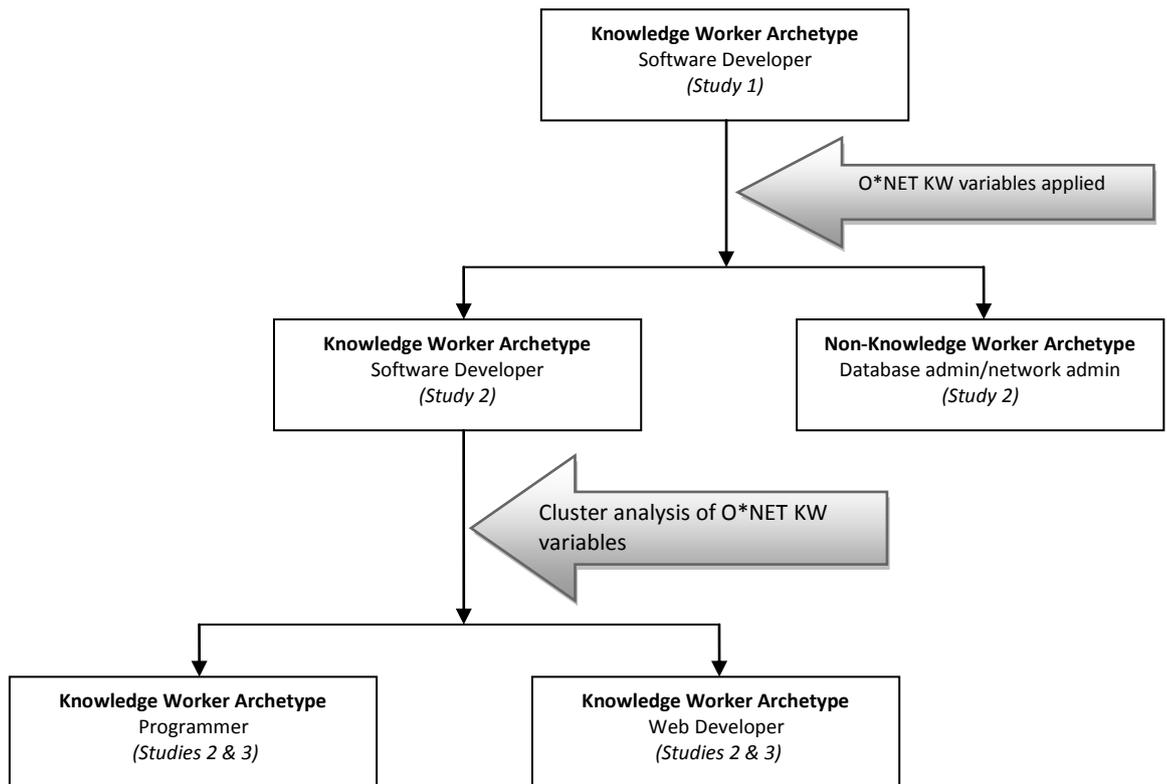


Fig 3.2 Archetype development

In order to adequately explore these revised archetypes and to deepen our understanding of knowledge workers and their perceptions of their work and organisations, the literature is reviewed in order to fully understand the differences between these two occupations. In response to the revision of the archetypes and the literature the theoretical model is reconceptualised with related hypotheses to enable this research study to adequately assess knowledge workers within the context of IT work.

### 6.3 Occupational literature review

The discussion in the previous section related to the granulated archetypes derived from the cluster analysis demonstrated that there were substantial differences found within the broader knowledge work archetype of software development. Therefore, revised archetypes of programmers and web developers were established in order to gain a fuller and more refined understanding of these knowledge workers. Here the literature is presented in order to reframe the archetypes as a response to the extant literature which identifies differences between these occupations. The KWCM is then adjusted to reflect these differences and the hypotheses reconceptualised in order to enable a detailed study of the archetypes in line with the model. It should be noted that, whilst building upon the literature presented in Chapter 5, the hypotheses reflect some new concepts which are derived from the literature reviewed in this chapter.

#### 6.31 Programmer Archetype

Programming can be traced, as a professional activity; back to the 1970's when IT was becoming more widely utilised within organisations as a more efficient way of conducting their existing business. For purposes of clarification it should be noted that the terms software developer, software engineer and coder are all synonymous with the term programmer and it is this term which will be used to represent these occupations. As the technology developed (and it did so rapidly), its use became more prolific within organisations and the software development industry was born seeing the number of associated IT workers increase becoming widely termed, certainly within academic quarters, as Information Systems (IS) Professionals. Much of the early literature in this field refers broadly to IS, aggregating all IS workers together in order to examine the emerging workforce which could largely be attributed to the relatively immature nature of the profession and the low levels of job differentiation or specialisation. As the IT industry began to mature and become more prolific there was increasing recognition that roles, such as that of the programmer, should be seen as discrete and treated as an individual unit of analysis within empirical studies. However, it should be noted that some work does continue to treat IS work and IS workers as being aggregated together, which can be problematic in endeavouring to better understand the nature of IT work, those who engage in it and the organisations in which they reside.

It is without doubt that technical knowledge is considered to be of paramount importance to programmers and their employing organisations. SOC (2010) describes the application of this technical knowledge through the primary tasks of programmers and software development professionals as determining requirements 'in the light of business needs' (p62), writing code

according to specifications, testing, implementation, evaluation and writing associated documentation. The O\*NET classification system identified that Interacting with Computers was of the greatest importance in the Work Activities of Programmers followed by Making decisions and Solving Problems. In descending order this was followed by Getting Information; Identifying Objects, Actions and Events; Communicating with Supervisors, Peers or Subordinates; Analyzing data or Information; Thinking Creatively and Updating and Using Relevant Knowledge (the arbitrary cut off point of 70 or more out of 100 in terms of importance is used). It is apparent that the predominant activity is technical programming work and any activities which are directly associated with programming (for example problem solving, data analysis etc) but it is interesting to note the relative importance that is placed upon the ability to communicate with internal stakeholders. The most important skills attributed to programmers are those related to programming (as would be expected) which is supported but other skills which would enable the programmer to engage in the act of programming such as critical thinking, complex problem solving and active learning. In this regard there is little to suggest that the programmer is engaged in extensive communication with a range of internal stakeholders beyond the team or indeed with any external stakeholders. In contrast to the objective ratings ascribed within the extensive O\*NET and SOC projects the SCALE21 (Davis and Lu, 2001) study was conducted using self-report questionnaires from 52 respondents to determine what were perceived to be the dominant characteristics of a range of IT occupations. In this study, undertaken in 2001, the dominant characteristic of programming was felt, by programmers, to be *attention* which was followed by *communication* and then by *technical understanding*. It is difficult to determine the scope and frequency of the communication understood in this report but it is clearly perceived to be an important aspect of the occupation. *Active listening* is also included in the skills outlined in O\*NET but it is reported to be of significantly less importance to programming than critical thinking and complex problem solving.

The question of the relative importance of technical skills in comparison with the 'soft skills' or business skills is one which was of interest within the early literature. Todd et al (1995) undertook to examine the content of job advertisements for Programmers, Systems Analysts and IS Managers which had been placed in 4 national newspapers in the United States from 1970 to 1990. This was specifically to examine the increasingly popular assertion in the contemporary literature that business and interpersonal skills were of increasing importance (p2). The study categorised the content into technical knowledge/skills; business knowledge/skills and systems knowledge. The greatest growth over time in business knowledge for programmers was in the sub-category of social skills with no mention of communication skills in 1970 to it becoming the most frequently mentioned

phrase in 1990 (Todd et al, 1995). In terms of business knowledge there were specific types of knowledge identified as being industry specific knowledge and functional area knowledge, the former gradually superseding the latter over the course of the twenty year period. The number of phrases relating to independence/motivation increased year on year along with communication and interpersonal skills. Systems skills such as general problem solving, design and programming were also mentioned with increasing frequency over the twenty year period which would suggest that it became important to be explicit about technical knowledge and competence in using specific technologies. In a general analysis of the data the authors identified that the three lowest ranking skills (represented by frequency of appearance in the advertisements) for programmers are management skills, business skills and problem solving skills. It should be noted that the authors recognise that this may be because these skills were already being evidenced in the population and therefore did not warrant being specifically mentioned. It may also be that the advertisements do not necessarily articulate the views held at executive level as they have been interpreted and written by a relatively low level employee. It is interesting to consider that the authors, with these acknowledged limitations, observe very simply that:

“...programmer (as characterized by their job ads) appear to be specialized employees who are required to understand information technology and general development process and must be able to communicate with others”

(Todd et al, 1995; p14)

However, they later note that whilst there has been some increase in the requirement for communication and other business skills for programmers this has not been substantial nor is there consensus as to what the business skills are that programmers should possess. This study serves to underline the requirements which are identified in the occupational classification data and also to emphasise the evolution of programming and the levels of sophistication around technical requirements of programmers. It does not however provide a great deal of convincing evidence that communication and business knowledge is any more crucial to undertaking this role than it would be in any other occupation. It would seem that breadth and depth of communication and business knowledge, which goes beyond what would be generally expected from any employee (i.e. the ability to communicate with peers and also to understand the terminology of the organisation), is not substantiated as being a significant requirement of programming in the studies outlined. It is interesting to note then that in an analysis of the predicted critical skills required by IS professionals Lee et al (1995) (note that programmers are not differentiated here) found from 98 responses from IS managers that all skills/knowledge categories of technical specialties, technology management,

business functional knowledge and interpersonal, and management were predicted as being of increasing import in the future for IS. However, there was a difference in relative importance with technical specialties knowledge reported to be ‘...the least important, for both now and in the future’ (Lee et al, 1995; p327) and with business functional knowledge and interpersonal/management skills as being the most important in the future. This perhaps serves to illustrate that there is a paucity of specific knowledge as to the true depth and breadth of the characteristics of programmers and the specific knowledge and skills which organisations’ expect them to be in possession of due to the prevalence of higher level studies and the time at which many of the studies were conducted.

Whilst the difficulty of the age of the literature remains there are some studies which have been conducted with programmers which give some insight into the job characteristics and various outcome variables. Cougar and Zawacki (1980) conducted a survey of over 6000 IT specialists with the broad finding that programmers had comparatively low social need strength and they had the highest growth need strength of any of the job categories in Hackman and Oldham’s study. Wynekoop and Walz (2000) in their investigation into the top performing software developers’ traits identified a number of traits from the literature which could be attributed to these workers. These included superior application knowledge, good communication skills, ability to work well in teams, able to translate user requirements into solutions, highly motivated, dependable, and creative in problem solving, self-confident and highly-motivated (Davis, 1993; Curtis et al, 1988; Walz and Wynekoop, 1997 cited in Walz and Wynekoop, 2001). It could be argued that some of these traits are not unique to programmers but could describe any high-performing individual. The study aimed to develop a parsimonious model of the traits of top performing developers through the use of Delphi technique with IT managers by asking them to describe the traits whilst thinking about three types of programmers as being 1) those who are best at making things work 2) those individuals who can best communicate with end users, identify requirements and turn into a logical design and 3) those destined for management (this differentiation was identified as being problematic when the authors identified the limitations of the study). There was a consensus after three rounds which determined the characteristics as being the ability to abstract business problems, creativity, technical and business knowledge, the ability to work with and lead teams, logic and analysis skills, high-levels of self-motivation, dependability and ability to organise. It is difficult to see how this would be unique to a programmer when it could equally be applied to many other knowledge workers, the characteristics of which were outlined in the literature review in Chapter 2.

Other approaches to empirical work have been to use work design/job characteristics to describe the performance, attitudes and behaviours of programmers or IS professionals. One such study was that conducted by Ang and Slaughter (2001) which sought to examine the differences between contract and permanent employees. Most of the contractors are programmers but it would not be appropriate to assume that these findings can be extrapolated to include all programmers as the findings are highly contingent upon the nature of the employment relationship. The findings suggest that feedback is sought from supervisors rather than being directly derived from the job/task as they have limited contact with the wider organisation. There is also evidence from the interviews conducted that the jobs are low in task variety, identity, significance, autonomy and feedback compared to their permanently employed counterparts. Whilst this does not serve to add to the construction of the programmer archetype it does illustrate the need to control for the type of employment contract when examining the results of the survey in Study 2.

Cheney (1984) sought to examine the effects of individual characteristics, job characteristics and organisational factors on programmer productivity and job satisfaction. The survey of 149 programmers from two US companies used a number of validated scales including the JDS. The findings relating to productivity demonstrated that experience was strongly associated with high productivity which could be argued to be the case in many occupations. The data relating to job satisfaction as the dependent variable showed that autonomy was positively related to productivity and also showed that task significance and autonomy were positively related to the level of job satisfaction, characteristics which have been attributed to knowledge workers through the literature review and Study 1. In examining productivity Cheney (1984) sought to find a suitable measure but concluded that this would be best reported on by the programmers' supervisor. This was due to his view that 'programming is still more an art than a science' (p212), an observation which could still arguably be levelled today.

It is with this observation in mind that the concept of creativity in relation to programming should be explored further. Glass (1992) examines this issue by identifying the polarity that existed in 1992 about the nature of software development being on one hand 'formal, disciplined processes' and on the other that development 'should be constructed using creative, free-form processes' (p38). The former being perceived by many to be required to ensure that it was systematic, logical and well-documented and the latter often treated with some suspicion due to the unpredictable nature of the creative process. The interviews and video analysis of designers and design processes that have been used to examine this subject have according to Glass (1992) provided a view that creativity (from a

process perspective) is an iterative, problem solving process which is conducted inside the mind of the programmer. The extent to which the programmer is given this amount of latitude will depend upon the breadth of the role, for example the aforementioned contractor will generally be required to write code to meet given specifications rather than be asked to design solutions. It is suggested by Glass (1992) that design can be seen to have several components including problem-oriented solutions, design-centric orientation, computer tool orientation and human involvement. The problem oriented component is often interlinked with the context of an application domain and as such it could be suggested that programmers engage in creative processes to the extent that they solve problems (of varying degrees of complexity) but that they would tend to be focused around Problem Identification and Information Searching (Zhang and Bartol, 2010) as Glass states '...designers rarely start from scratch' (p 41). Idea generation may be required of programmers but this would be dependent upon the scope of the development role and, in line with the occupational classification observations, activities would in the main be related to problem identification and information searching. Similarly, Couger et al (1993) underpinned their research into (un)structured creativity by citing a prominent discourse from the 1980's emphasising the importance of innovation and creativity in generating competitive advantage. They acknowledge that there is variation in the conceptualisation of creativity, with the dominant schools being origin-oriented and process-oriented but they firmly assert that within programming it should primarily be viewed from the process perspective as 'creative problem-solving'.

### 6.32 The Emergence of Web Development

Web Development, or Web Engineering as it was sometimes termed, can be traced back to the origins of the World Wide Web in the early 1990's. The World Wide Web, and associated technologies, developed rapidly between its inception by Berners-Lee in 1989, where it was developed as a method of storing, sharing and making searchable documents in the scientific community, and its use by wider society as a vehicle for communication, information sharing and commerce. The establishment of the World Wide Web Consortium (W3C) in 1994 signalled the foundation of common protocols for those programming/developing for the Internet. At a similar time the academic community recognized the distinction which was emerging between traditional programming activities and those associated with web development. Ahmad et al (2005) in their Journey of Web Engineering identify the first paper presented about Web Engineering related problems in 1996 with the first workshop dedicated to the new discipline in 1998. It could be suggested that any literature from this transition period relating to Information Systems and IT

workers implicitly included this new group of workers specializing in Web Engineering or Web Development. As the Internet became broadly established with the development of a distinct terminology to describe the types of processes and behaviours associated with Internet development and usage, the discrete discipline of web development /engineering emerges. That is not to suggest that the broader term of 'IS/IT professionals' hasn't continued to be used as a general categorization of these workers over the last 30-40 years but that during the early 90's there was an acknowledgement, both with the profession and the academic community, of the distinctiveness of web-based development from the programming activity which had existed up until this point. This established distinctiveness and contextualization of web development allows for further discussion of the characteristics and requirements associated with the role and the individuals who engage in this activity.

### 6.33 Web Developer Archetype

The establishment of web development (this term will be used in preference to web engineering as it relates more specifically to the discipline surrounding the systematization of the work) as distinct from programming should be seen in the context of rapidly evolving technologies and broader societal adoption of these. As with the programmer archetype this portrait will focus upon the reported characteristics of web developers and the work in which they are engaged, drawing from academic and industry literature and from the O\*NET Occupation Requirements and SOC data. There are areas of similarity in terms of the characteristics and job role of the web developer archetype and the programmer archetype, which is unsurprising given the shared heritage of these two professions and their chronological development. Much of the early literature focuses upon the need for structure and common protocol for web development activities emanating from the experiences of adoption and adaption of new technologies within the early programmer community. Ahmad et al (2005) suggest that web engineering and software engineering could be likened to siblings. To extend this simile further the web developer could perhaps be viewed as a younger sibling who has benefited from the experiences and learning of the older child. The second child has the benefit of this already acquired knowledge (albeit in a different context) and as such differs from the older sibling in experience and temperament - themes which will be explored further using the aforementioned sources in constructing the archetype of the web developer.

Literature relating to web developers and web development is concentrated around the late 1990's and early 2000's as the discipline begins to emerge with the development of the Internet and web-based technologies. There is little literature devoted to the subject after this time as a broad

acceptance develops of the technology and associated jobs roles and skills. Therefore much of this archetype is derived from literature from the early transition phase supported by the observations within the O\*NET and SOC data.

In the early web development literature the dominant theme is that of the breadth of skill required to perform this role which is illustrated by Tilley and Huang (1999)

“...To be successful in today’s net-centric and Web-enabled world, one now needs to know a lot about a lot...There are now so many different aspects to application software that there is a (re)emergence of the renaissance person, one who is comfortable operating in several disciplines...The complexity of system construction and evolution in a Web-Oriented world is driving this renaissance”

(Tilley and Huang, 1999; p1)

This renaissance ‘person’ is very much perceived by Tilly and Huang (1999) and their contemporaries to require knowledge of a wide range of technologies and skills relating to the web. Many of the descriptions of web development (and web developers) refer to it as being multidisciplinary which is seen as being a defining characteristic of this new role (Murugesan et al 1999). The suggestion that the web-based systems would be ‘uniquely challenging’ particularly with regards to the nature of ‘real-time interaction, complexity, changeability’ (Ginige and Murugesan, 2001; p22) would therefore necessitate that the web development role has complementary characteristics. This is identified in the SOC (2010) which describes the typical tasks of Web Design and Development Professionals as inclusive of design and development of the website including web interfaces for relational database systems, methods of website security and recovery, testing and monitoring. However, there is also recognition that Web Development goes beyond the requirement to be able to use multiple technologies in that there is a significant necessity to be able to interpret business requirements and to act as translators of these for technical purposes. In the SOC (2010) this is included as ‘liaises with the internal/external client in order to define the requirements for the website’ (SOC, 2010; p63).

Taylor et al (2001) identified that web development differed significantly from ‘traditional Information Systems’ with different audiences and purposes, shorter development times and shorter product life-cycles. As such, the study of 20 organisations (across a range of types with over 50% of the organisations having distinct web developer roles) which examined the “full range of skills and knowledge that web site developers may be called upon to use” (p 452) sought to determine a skill set required for web development. Interviews were undertaken with IT staff engaged in web development work using questions derived from literature which suggested, largely without empirical support, the types of skill and knowledge which might be required by these workers. These

included technical skills, but of equal significance in the study is the requirement for business and analytical skills, although this was only considered to be significant to 20% of the interviewees and as it was a qualitative study inferences of importance should not necessarily be made based upon quantitative measures. This was an early attempt to classify the skills required in this occupation which has been borne out by the job classification exercises discussed earlier in the SOC and the O\*NET classification system. The analytical skills segment of the Venn diagram (see Fig 6.2) produced from the research study included requirements analysis, cost-benefit analysis and interpreting user requirements.

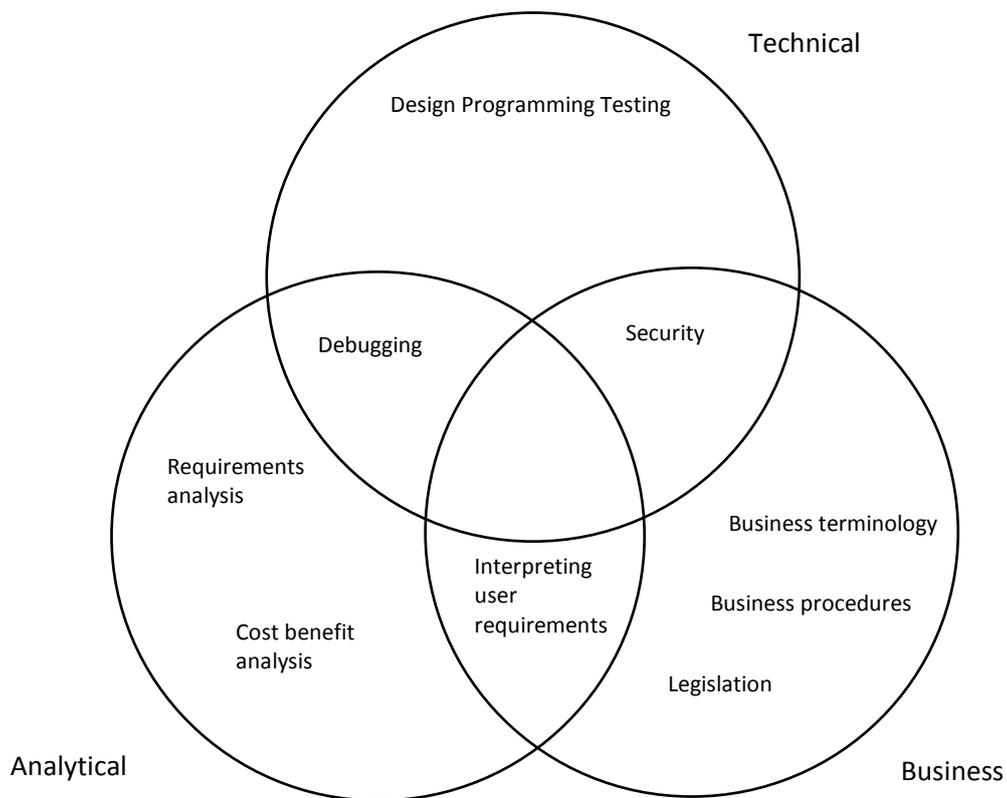


Figure 6.2 Skill sets required for web site development

The latter skill was also shared by the business skill set which included understanding business terminology, business procedures and legislation. It is evident in the literature, which is limited in its empirical content, that the need for communication and interpreting ideas is considered to be a key component of web development or perhaps, given the time frame of the literature it may be more appropriate to suggest that it was *predicted* that these skills would be of importance to the role.

This need for broader business skills is also recognised by Taylor (2006) who identified 'Web Competencies for IT students' determining that, in addition to essential technical expertise, they also require skills in '...teamwork, communication (both verbal and oral) and commitment to lifelong learning due to the rapidly changing nature of the field' (p1). This would suggest that a developer needs to be accomplished in technical and interpersonal skills and also be oriented towards continual learning. Pressman (2000) also emphasises the need for this broader business acumen, specifically the ability to engage with customers as early as at the formulation stage of the project which precedes the technical analysis stage. This ability to engage with a wide range of stakeholders and to constantly communicate with customers throughout the duration of the project is seen as one of the key facets of the web developer's role. The SCALE21 research supports the observations made by the aforementioned authors. As previously mentioned in the programmer archetype the project used data from 52 respondents to determine what skills/abilities were felt to be of importance to each of the IT occupations. The most significant principle components (those with a mean score of 4.5 or above) reported by web developers were found, in descending order to be technical understanding, communication and verbal reasoning supporting the literature outlined previously. An additional 'dominant characteristic' for web development was flexibility which was determined to be one of the core skills. This may be explained by the requirement for web developers to interact frequently with stakeholders (internal and external) and the observation from the contemporary literature that the rapidity of technological change was a prominent feature of this role. The observation of the authors from the data collected was that web development was a specialised occupation which exhibited strong technical expertise but that this could be attributed to the nascence of the occupation. The report also identifies that the dominant characteristics of web developers are a higher order combination of a range of the core activities which is more akin to work such as strategy development. This could be linked to the breadth of the role in terms of customer contact, business knowledge and boundary spanning behaviours.

Contemporaneous literature would suggest that the web developer was a lone figure, the sole interpreter of business requirements, tester of applications, and designer of the User Interface dealing with projects and a wide range of stakeholders with the required immediacy (Pressman, 2001). This may have been an appropriate assumption in the early days of web development but in large organisations, where web developers are working as part of development teams the broad roles which were initially identified are now specialisms of web development, for example teams may have a User Interface specialist, a tester, a project manager etc. Ginige and Murugesan in 2001 predicted this, with the anticipated increase in the size of projects, there would be a greater need to

have teams of people of “different types and levels of skill to work together necessitating distributed, collaborative development” (p23). Whilst it is evidently the case that some larger organisations require development teams with a range of differentiated skills it is also evident that small to medium sized organisations require the ‘traditional’ web developer who fulfils the initially identified multi/interdisciplinary role.

As a result of the refinement of the archetypes, the KWCM and hypotheses are now reconceptualised to reflect the literature reviewed. The hypotheses are established to reflect the differences between programmers and web developers in the context of the KWCM. As they are new and fundamentally different hypotheses, they are numbered as a continuation of the original set.

#### 6.4 The Reconceptualised KWCM

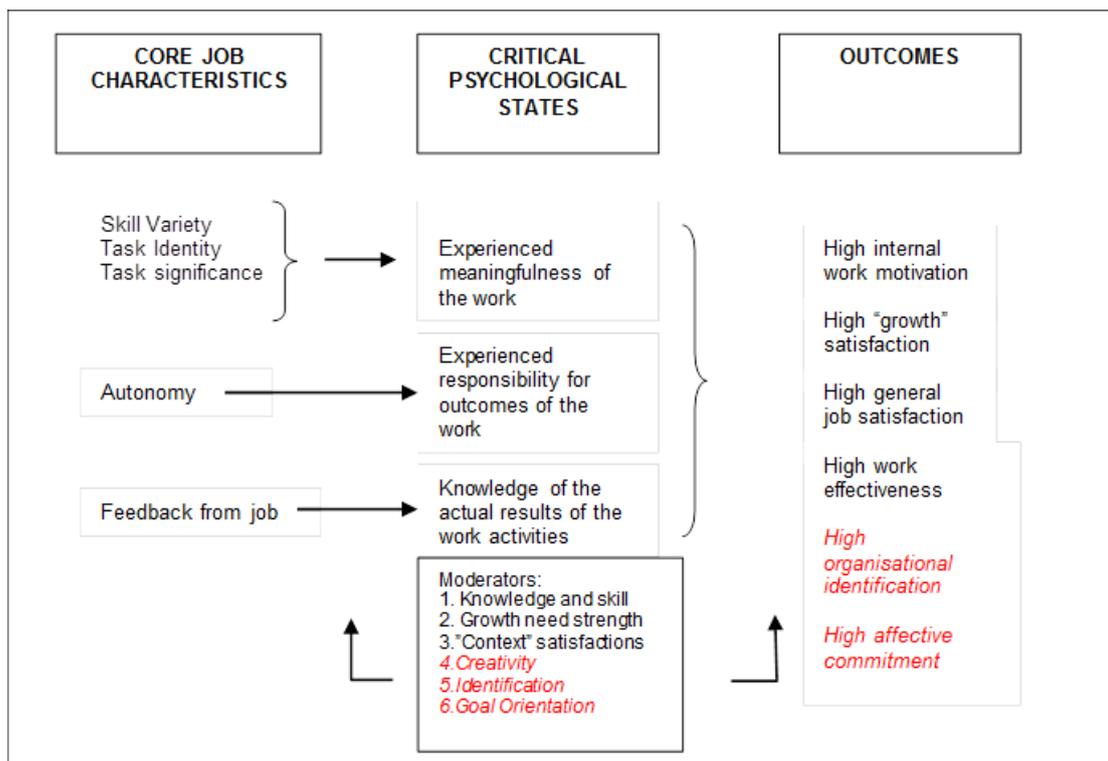


Figure 6.3 The Reconceptualised KWCM

#### 6.41 Job Characteristics

Despite the commentary which suggests that the need for communication and business skills is increasing, the accounts of programmers work demonstrates that they primarily undertake tasks which are clearly specified and which are identifiable as complete pieces of work which are nested within a bigger development projects (SOC, 2010). Todd et al's (1995) study of skills which were

required of programmers over a twenty year period illustrated that there was little call for wider business skills as they primarily were required to be highly specialised employees who could do the technical work. This is in contrast to the work undertaken by web developers who are considered by Tilley and Huang (1999) as being 'renaissance persons' who are capable of developing systems which demand real time interactions, complex management and changeability (Ginige and Murugesan, 2001b). Given the suggestion from the literature that web development work would be more highly responsive and complex it is hypothesised that:

*H14: Skill variety will account for the greatest amount of variance in experienced meaningfulness of work for web developers.*

*H15: Task identity will account for less variance in contributing to experienced meaningfulness of the work for web developers than programmers.*

Web developers, given the breadth of their role outlined in the literature review, would be expected to have a greater amount of autonomy in their roles. The suggestion that their roles are, in contrast to programmers, multidisciplinary requiring engagement in tasks which are complex and changeable (Murugesan et al, 1999) would therefore lead to the following hypothesis:

*H16: Autonomy will account for a greater amount of variance in experienced responsibility for outcomes of the work for web developers than programmers.*

Similarly, the breadth of the role and the need to manage multiple stakeholders would suggest that web developers would typically receive less feedback from the job itself in contrast to feedback from external sources. Programmers, given that they engage in more discrete tasks, would be expected to receive a greater amount of significant feedback from their completion of the programming tasks which are predominantly assigned to them by others (Glass, 1992). Thus, it is hypothesised that:

*H17: Feedback from the job will account for a greater amount of variance in knowledge of the results of work activities for programmers than for web developers.*

Given the amount of variety which is suggested as being part of the web developer role it could be hypothesised that the experienced meaningfulness of the work would be of greater import for the programmes than for the web developers. The web developers would be expected to derive experienced meaningfulness of work from a range of other aspects of their work which are not

necessarily directly connected to skill variety, task identity and task significance. It could be that these are derived from the wider scope of the work, possibly from managing a wider range of stakeholders, communicating with end users and the specification and delivery of the work, that is, multidisciplinary activities. It is therefore hypothesised that:

*H18: Experienced meaningfulness of the work will account for a greater amount of variance in internal work motivation for programmers than for web developers*

Pressman (1999) identifies that, in contrast to the programmer's role, web developers engage in more boundary spanning activities and would therefore be more closely involved in decision-making activities as part of their of daily work. In the knowledge work literature review autonomy was frequently discussed in conjunction with such independence and decision-making skills which would appear to be more applicable to the type of work which web developers engage in and therefore derive satisfaction from.

*H19: Experienced responsibility for outcomes of the work will account for a greater amount of variance in experiencing job satisfaction for web developers than for programmers.*

#### 6.42 Identification

If there is inconsistency or conflict between the goals or expectations of groups/teams within the organisation this may prove to be problematic for those who are working across these various teams in terms of conflicting identity. For web developers, who are engaging in interdisciplinary and boundary spanning activities (Pressman, 2001), there is a greater likelihood that identification will be stronger in terms of focus upon a specific team and also the increased levels of internal exposure and engagement will increase organisational identification for this group. This can be seen in group identification described by Mael and Ashforth (1992) as characterised by individuals perceiving their own fate to be connected to that of the group and the group's successes or failures being experienced by group members. It is therefore hypothesised that web developers may have a greater affinity with the organisation and wider community due to the type of tasks they undertake and their breadth of reach within the organisation.

*H20: Web developers will identify more strongly with their team than will programmers.*

*H21: Web developers will identify more strongly with their organisation than will programmers.*

Given that programming has been in existence longer than web development and that the professional bodies have developed alongside programming as an occupation pre-Internet it is anticipated that programmers will feel a greater affinity with these organisations than web developers. Given this historical development and the typical web development role it is less likely that web developers will find the activities and discussion of relevance and value. It may also be the case given the amount of involvement from professional bodies in determining academic curricula which the programmers may have been exposed to in their training.

*H22: Programmers will identify more strongly with their occupation than will web developers.*

In relation to this it was also hypothesised that due to the strength of the web developers' identification with the team, as outlined above, that team identification would moderate the relationship between the core job characteristics and the outcomes more than in the programmer group.

*H23: The moderating effect of team identification on the relationship between the core job characteristics and the outcomes will be greater for web developers than for programmers.*

#### 6.43 Creativity

The notion that the creative process differs according to the type of problem solving activity which was identified by Amabile (1983; 1988; 1996) and her contemporaries, is detailed in the theoretical framework for examining knowledge work. This problem solving activity is commonly described as being either heuristic or algorithmic in nature (although Amabile acknowledges that this binary opposition can detract somewhat from the proposed continuum of creative process engagement). It was suggested that these terms could be applied to knowledge worker and non-knowledge workers respectively as a way of supporting the hypotheses relating to creativity.

The cluster analysis differentiation within the knowledge work category and the resultant reconceptualisation of the theoretical framework and hypotheses would lead to the question as to whether the nature of engagement in the creative process differs between the two knowledge worker archetypes. Programmers and web developers appear to have a broadly different array of tasks involved in their roles, largely attributed to the breadth of the work engaged in by the latter. As stated, web developers are perceived to be in dialogue with a wider range of internal and external stakeholders who participate in formulating and reformulating the problems being worked upon.

The early stages of Amabile's componential model identify engagement in algorithmic problem solving which should be more likely to be reflected in the programming role. The complexity of the problem solving which is identified in the web development role could be suggested to be more frequently and consistently heuristic and therefore more likely to be reflected in increased idea generation activity. The theoretical model has therefore been reconceptualised to reflect these suggestions in order to explore these archetypal knowledge workers engagement in the creative process. Therefore the following hypotheses are proposed:

*H24: Programmers will report higher engagement in problem identification and information searching activities than web developers.*

*H25: Web developers will report higher engagement in idea generation activities than programmers.*

Once again, the assumption that the complexity of the problems (in terms of social complexities and intra/extra organisational demands which may obfuscate and confuse the conceptualisation of the problems) can be used to further examine the outcomes of satisfaction, internal motivation and growth satisfaction. The notion that programming work is more usually located at the front end of the creative process i.e. it is algorithmic (albeit highly complex) would suggest that idea generation is less important as an intrinsic motivator for programmers than it is for web developers who may more frequently be involved in heuristic work demanding idea generation due to their breadth of their role and the complex social demands placed upon their solution development. Therefore the following hypothesis is established in order to explore creativity/problem solving further within these groups:

*H26: The moderating effect of idea generation on the relationship between the core job characteristics and the outcomes will be higher for web developers than for programmers.*

Although it should be noted that intrinsic motivation is referred to in the literature as an outcome variable and also as an independent variable which affects the level of creative process engagement.

#### 6.44 Goal Orientation

Due to the level of exposure to the wider organisation this 'renaissance man' engages in multidisciplinary activities in the web development role (Tilley and Huang, 1999) and with a number of different stakeholders. Therefore, the literature would suggest that these workers are not averse to being exposed to the scrutiny of others. This appears to be in contrast to the programmer role whereby the highly specialised technical skills are prized as being indicative of their expert identities (Todd et al, 1995). It is hypothesised therefore:

*H27: Programmers will report a higher avoid goal orientation than web developers.*

This is primarily due to the historical context and the well established understanding of the programmer role and the suggested requirement to maintain this expert persona. It is hypothesised that the desire to avoid activities which may result in open displays of failure therefore will moderate the relationship between the job characteristics and the outcomes for the programmer group.

*H28: The moderating effect of avoid orientation on the relationship between the core job characteristics and the outcomes will be greater for programmers than for web developers.*

The desire to avoid failure which could be detrimental to the established expert identity is also suggested to be accompanied by the desire to prove competence in the role. As tasks are more clearly defined for programmers it could be suggested that there is a greater degree of exposure to criticism in failing to perform which will also impact upon the outcomes within the KWCM. As Steele–Johnson’s (2000) research suggests where tasks are simpler there is greater satisfaction for those with a prove goal orientation. It is therefore hypothesised:

*H29: Programmers will report a higher prove orientation than web developers.*

*H30: The moderating effect of prove orientation on the relationship between the core job characteristics and the outcomes will be greater for programmers than for web developers.*

Given the requirement to adapt to new technologies, the desire to engage in problem solving activities and the pace of change within development work, it is suggested that both programmer and web developers will have strong learning goal orientations. As stated in the conceptual framework literature review it is possible for individuals to hold a combination of goal orientations and therefore these competing orientations can be evident. Given the nature of the work and the fact that knowledge work is premised upon the concept of the continual acquisition and application of knowledge it is anticipated that a learning orientation will be equally strong in both groups.

*H31: There will be no difference between the web developers and the programmers in their learning orientation.*

#### 6.45 Commitment

As web developers are suggested to operate in organisations in terms of boundary spanning activities, involvement in different facets of the work and engagement in work which transcends both team and organisational boundaries, it could be suggested that they would be more likely to develop an emotional attachment to the broader organisation. Meyer and Allen (1997) identify strong correlations between affective commitment and autonomy and skill variety, which are hypothesised here to be more predictive of the critical psychological states for the web developers than for programmers. The greater level of exposure for web developers to the wider organisation in terms of its goals and its external foci differs considerably to the experiences of programmers who could be suggested to have fewer interactions with parties outside of their immediate team and supervisor. By virtue of this broader organisational exposure it is hypothesised that:

*H32: Web developers will report higher affective and normative commitment than programmers.*

The literature suggests that commitment and identification are frequently conflated and this hypothesis seeks to address this issue. It is hypothesised that, due to their multidisciplinary and boundary spanning intra and extra-organisational roles, web developers will experience a greater moderating effect of organisational identification between MPS and affective commitment:

*H33: The moderating effect of organisational identification on the relationship between MPS and affective commitment will be greater for web developers than for programmers.*

#### 6.5 Conclusion

This chapter details the refining, or granulation, of the archetypes as a result of using a cluster analysis to assess the knowledge work variables. This was prompted by a weak response in the original non-knowledge work occupational categories of database/network administrator. This analysis moved away from the assessment of a high or low score by examined the way these scores clustered occupations together in terms of their similarities in the knowledge work variables. This demonstrated that there was an unexpected difference in occupations which are widely aggregated under the broad categorisation of software developers. Web developers and programmers were therefore determined to be two distinct knowledge worker categories due to the way that the data was clustering. The focus of the research thus moves from using the non-knowledge worker archetype to contrast against the knowledge worker archetypes in order to answer the research questions and meet the research objectives. The research is refocused to examine differences

between two occupational knowledge worker archetypes which have been aggregated in much of the literature and empirical work to date as software developers. Therefore the two knowledge worker archetypes of programmers and web developers were established using a literature review and new hypotheses proposed in order to test the reconceptualised KWCM. The forthcoming chapter reports the results from Study 2, the global survey, initially by describing the whole respondent sample before examining the data according to the two occupational groups. The hypotheses established in this chapter are tested and relationships reported in order to develop a more comprehensive understanding of these knowledge worker archetypes and their perceptions of the work which they undertake. The findings are then developed further in the qualitative study reported in Chapters 8 and 9 in order that a fuller picture of knowledge workers is painted in relation to the stated objectives of this research study.

## Chapter 7 Study 2 Findings and Discussion

### 7.1 Introduction

This chapter details the findings and discussion relating to the Knowledge Worker Survey data. Study 2 focuses upon Objectives 1 and 2 and is designed to test the hypotheses in relation to the established archetypes. An analysis of the whole sample is presented initially before detailing the findings and discussion pertaining to the reconceptualised KWCM and redefined hypotheses presented in Chapter 6 (listed in appendix 2). It begins by examining the complete sample before analysis of the programmer and web developer samples (demographics and organisation details) to establish the comparability of the two archetype groups. It then proceeds to discuss the findings in relation to the hypotheses. The presentation of the findings and discussion corresponds with the development of the hypotheses presented in Chapter 6 rather than the more conventional approach of reporting according to the type of test performed. It is considered that this allows the form of the model and the development of the hypotheses to be more clearly seen through the use of this approach. The chapter concludes with a general discussion of the results and the implications for the development of the programme of research within the qualitative study.

### 7.2 Data Analysis of the whole sample

As detailed in Chapter 3 a total of 521 responses to the survey were received of which 237 were fully completed with missing cases excluded pair-wise from the analysis. The data was screened and tested initially as a complete sample before separating into the occupational archetypes. Descriptive statistics were computed for the whole data set in order to determine the characteristics of the sample for this study, by analysing demographic data and educational qualifications, before splitting the categories down into the knowledge worker archetypes for further analysis. The demographic data will be compared to that derived from eskills (2009) (UK sector skills) and EMSI (2012) (US economic modelling specialists) reports which are considered useful comparators given that respondents from these countries make up the largest proportion of the sample.

#### 7.21 Qualifications

One of the defining features of IT work is that it is considered to be populated with a highly skilled and qualified workforce, with authors such as Marks and Scholarios (2007) using this as an independent variable in their study of knowledge work. Of the sample reported here (see Table 7.1) 82.6% a higher education qualification. Almost two thirds (65.7%) have obtained an IT-related

qualification, and a little over a quarter (26.6%) are qualified at postgraduate level. This can be compared to the eskills data (2009) which reported 62% of all IT workers holding an HE qualification in the UK, (in contrast to the only 36% of the UK employed population eskills, 2009). The EMSI data states that 50% of IT workers have an UG degree with 29% having a PG qualification, although it does not state that this is specifically IT related. Therefore this sample appears to having a more highly qualified number of respondents compared to the UK and USA at UG level but it is comparable with the US at PG level.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid UG IT related	187	35.9	45.7	45.7
PG IT related	82	15.7	20.0	65.8
UG Non IT	42	8.1	10.3	76.0
PG Non IT	27	5.2	6.6	82.6
Professional	9	1.7	2.2	84.8
High School	10	1.9	2.4	87.3
College	44	8.4	10.8	98.0
None	8	1.5	2.0	100.0
Total	409	78.5	100.0	
Missing System	112	21.5		
Total	521	100.0		

Table 7.1 Highest Qualification

#### 7.22 Age

The age distribution of the whole sample is presented in Figure 7.1. Ages ranged from 19 to 62, with a mode age of 28. The histogram illustrates that the distribution is normal with a slight positive skew and neither kurtosis nor skewness are considered to be significant. The distribution of age within the sample is comparable with the general population described by eskills (2009). EMSI report that 68% of IT workers in the US are in the band 25 years to 44 years. Whilst the age of the population is not a variable which will be tested within this study it serves to demonstrate that the sample is broadly representative of the UK and US IT worker population in that it is a relatively young workforce.

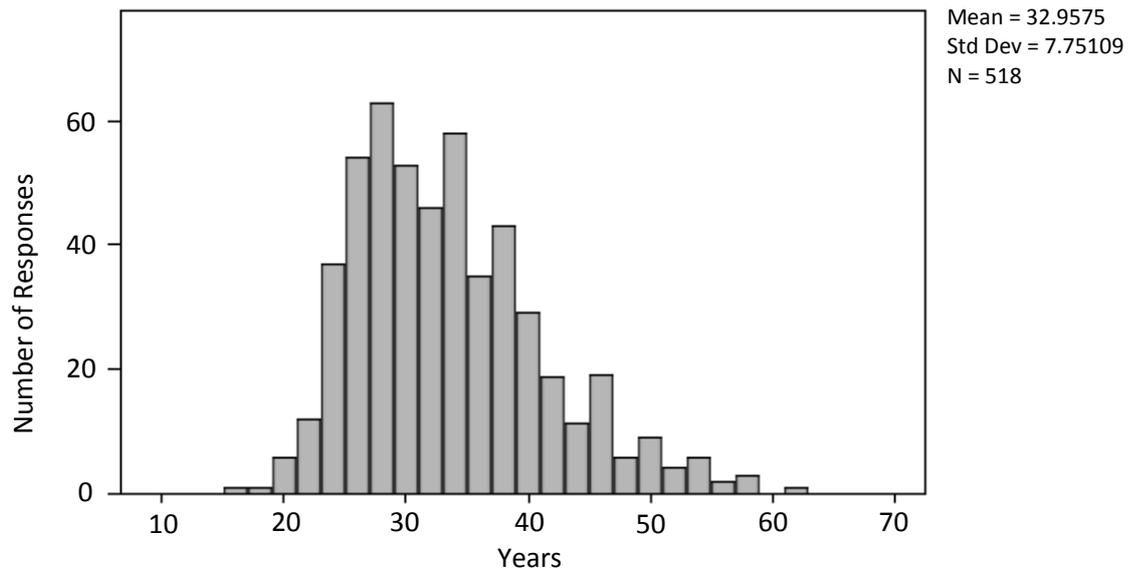


Figure 7.1 Age of respondents

### 7.23 Gender

It is unsurprising to see that women make up a relatively small proportion of the sample; only 5.2% (27 respondents) (see Table 7.2). This is lower than the percentage of women in IT reported by the sector skills council as 18% in 2010 (eskills, 2012). The US figures show the figure at 16% of IT workers as being female. This under-representation in this sample may be connected to the routes into survey completion via the BCS, through the use of stack overflow, or following Joel Spolsky on Twitter. It may also be that this sample is less representative of the roles which women tend to be employed in. It is difficult to make this assessment given the lack of information available in the public domain about the types of roles women work in. However, as this study does not assess gender differences in relation to knowledge work this is more a point of interest than a significant factor in the analysis.

	Frequency	Percent	Valid Percent	Cumulative Percentage
Male	485	93.1	94.7	94.7
Female	27	5.2	5.3	100.0
Total	512	98.3	100.0	
Missing System	9	1.7		
Total	521	100.0		

Table 7.2 Gender

## 7.24 Country of Residence

The sample can be said to be broadly representative of the general IT population represented by UK data (e-skills, 2009) and US data in terms of age distribution and qualifications. The comparative data has been drawn from the UK and US contexts primarily due to ease of access of information regarding the national context, but also the largest proportion of workers in the sample reported that they were located in the US (200, 38.8%) with half that number being resident in the UK (100, 18.0%). Figure 7.2 shows the residency of the survey respondents indicating the most prominent groups to be from the US and UK but with many other countries represented in the sample, albeit in low numbers which, when aggregated, are more than the UK responses.

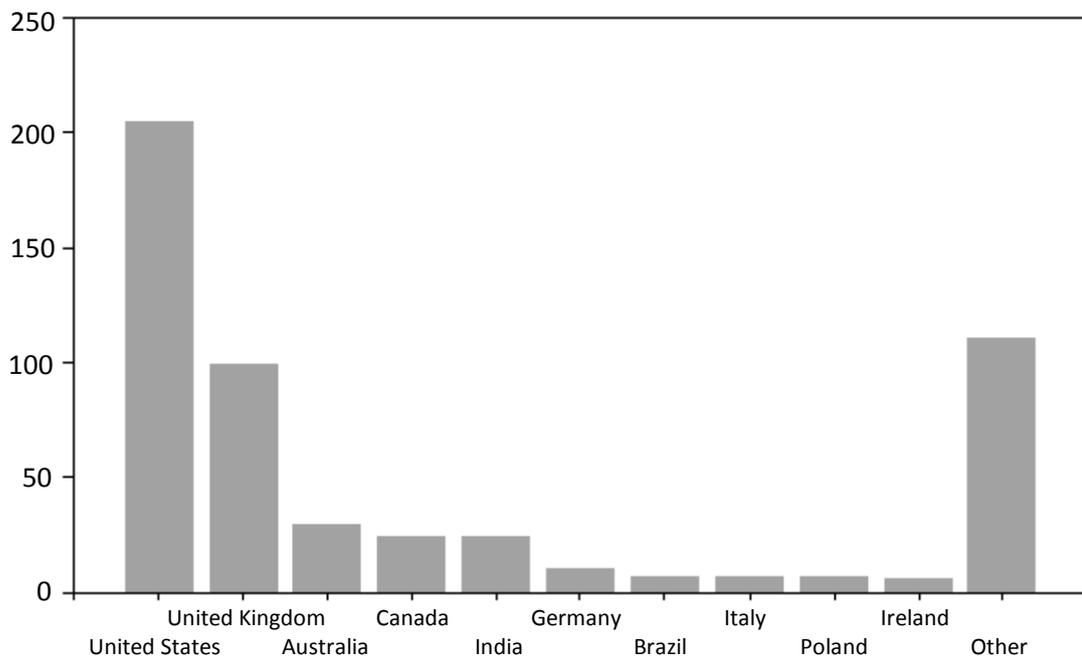


Figure 7.2 Country of Residence

Whilst there may be some notable differences in the national contexts in which respondents are located which may have the potential to impact upon the workers' experiences (for example variation in the quality of infrastructure), the proportion of these workers in the sample is low and therefore it is unlikely to affect any inferences drawn from the data. Moreover, the access to the survey itself says something about the infrastructure available. Two main access points to the survey were identified from the responses (Stack Overflow and Joel Spolsky's Twitter feed), which would suggest that the technologies and points of interest are globally commonplace and therefore variance within the sample related to national difference is expected to be negligible. Whilst there

may be some variance in the conditions of national labour markets there is known to be a global demand for IT workers (Weitzman, 2012; Bateman, 2012), particularly for developers and programmers, and as a consequence, the workforce is highly internationally mobile.

### 7.3 Descriptive data analysis for the granulated archetypes

The sample was refined according to the occupational groupings of programmers and web developers as proposed in Chapter 6. The data detailed in Tables 7.3 and 7.4 below present the descriptive statistics for the samples.

<b>Variable</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>N</b>
<b>SKILL VARIETY</b>	5.4923	1.16092	195
<b>TASK IDENTITY</b>	5.0350	1.33056	195
<b>TASK SIGNIFICANCE</b>	4.7598	1.35443	195
<b>AUTONOMY</b>	5.4402	1.22328	195
<b>FEEDBACK FROM JOB</b>	4.7282	1.29218	195
<b>COMBINED GNS</b>	5.5040	.84694	208
<b>MPS SCORE</b>	139.5817	67.79227	195
<b>Organisational Identification</b>	3.7520	1.44052	125
<b>Team Identification</b>	4.7120	1.36675	125
<b>Professional Identification</b>	5.4240	1.16580	125
<b>Community Identification</b>	4.3710	1.50591	124
<b>CPE: Problem Identification</b>	4.2302	.48528	126
<b>CPE: Information Searching</b>	4.0344	.63747	126
<b>CPE: Ideas Generation</b>	3.5548	.65392	126
<b>Goal Orientation: LEARNING (RS)</b>	1.7578	.70751	128
<b>Goal Orientation: AVOID (RS)</b>	4.5189	.88940	128
<b>Goal Orientation: PROVE (RS)</b>	3.1465	.97938	128
<b>Affective Commitment (RS)</b>	3.9843	1.54256	132
<b>Continuance Commitment (RS)</b>	4.6967	1.27132	132
<b>Normative Commitment (RS)</b>	4.3308	1.43259	132

(RS) Reverse Scored

Table 7.3 Descriptive data for the Programmer Sample

<b>Variable</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>N</b>
<b>SKILL VARIETY</b>	5.4092	1.24418	112
<b>TASK IDENTITY</b>	5.2902	1.26530	112
<b>TASK SIGNIFICANCE</b>	4.6190	1.51856	112
<b>AUTONOMY</b>	5.6681	1.12610	113
<b>FEEDBACK FROM JOB</b>	4.7917	1.24571	112
<b>COMBINED GNS</b>	5.5929	.92281	123
<b>MPS SCORE</b>	146.0297	67.03713	112
<b>Organisational Identification</b>	3.5342	1.49148	73
<b>Team Identification</b>	4.4795	1.43478	73
<b>Professional Identification</b>	5.2877	1.27453	73
<b>Community Identification</b>	4.1644	1.55469	73
<b>CPE: Problem Identification</b>	4.2619	.52288	70
<b>CPE: Information Searching</b>	4.1619	.68040	70
<b>CPE: Ideas Generation</b>	3.5850	.72138	70
<b>Goal Orientation: LEARNING (RS)</b>	1.6930	.76706	71
<b>Goal Orientation: AVOID (RS)</b>	4.6127	.79932	71
<b>Goal Orientation: PROVE (RS)</b>	2.7664	1.09957	71
<b>Affective Commitment (RS)</b>	3.8733	1.52626	75
<b>Continuance Commitment (RS)</b>	4.5956	1.21557	75
<b>Normative Commitment (RS)</b>	4.2356	1.49426	75

(RS) Reverse Scored

Table 7.4 Descriptive Data for the Web Developer Sample

As was stated for the whole sample, due to varying degrees of attrition throughout the survey, responses which contained missing data were excluded from the analysis pair wise. The programmer sample ranged from 208 valid responses down to 124 whilst the web developer sample ranged from 123 at down to 70 responses.

### 7.31 Examining differences between the groups

In order to fully understand the two knowledge worker archetypes (programmers and web developers) which the analysis now focuses upon, the details of the two samples are explored further using descriptive statistics before examining the data in relation to the hypotheses and KWCM (using t-tests and regression analyses). The group data will thus be referred to as separate

samples rather than groups or archetypes in examining the comparability of the data. The analysis of the two samples using descriptive statistics allows the researcher to identify if the samples are comparable in terms of the distribution of the data and to determine the extent to which any differences may affect the testing of the hypotheses.

### 7.311 Age

In examining the age of the respondents in both samples it was apparent that there is a positive skew in the age distribution for programmers and that the distribution had a longer tail to the right in the programmer sample (see Figs 7.3 and 7.4).

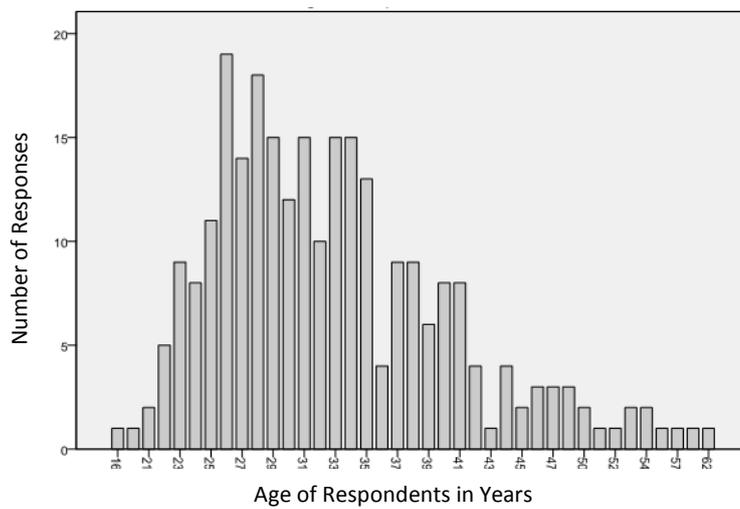


Figure 7.3 Age of Programmer Group

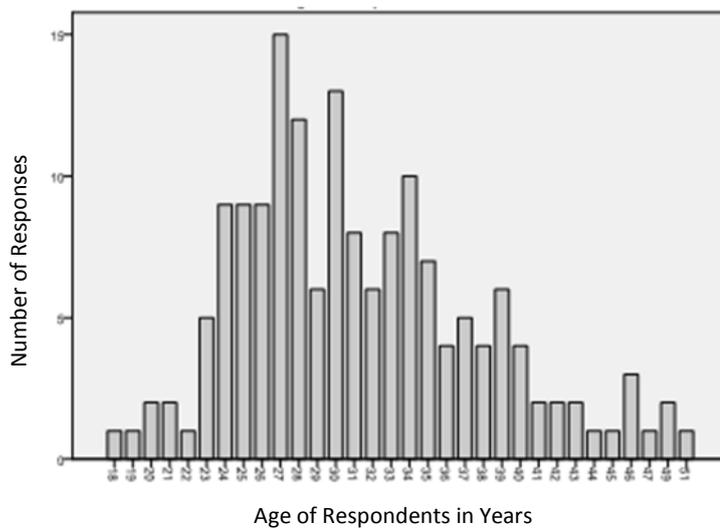


Figure 7.4 Age of Web Developer Group

It is interesting to note that there were no respondents over the age of 52 years in the web developer group, whereas 3.6% of the programmer sample was over this age. 84.6% of the programmer sample was aged 40 years or less compared with 90.7% of the web developers being under this age. This pattern was similar lower down in the age range with 44.4% of the programmers being aged 30 years or under compared to 52.5% for web developers. The profile of the respondents' ages fits with the historical development of these two occupations with web development becoming prominent in the late 1990's. However, that is not to say that programming has been usurped by web development, as the positive skew in the programmer distribution demonstrates that there are younger programmers entering the profession. If anything it would suggest that the web development curve may be moving to the right with few newer graduates entering this particular occupation. This assumption should be approached with caution as it may be that the respondents' points of entry to the survey differed according to level of technical experience, which may also be associated with age and length of time in the occupation. Therefore, the depth of immersion in the technology and in the development culture may be less prominent in the lower age group and therefore have reduced the number of respondents in this age group.

### *7.312 Length of Time in the Occupation*

A variable closely related to age is that of the length of time that the respondent has worked in IT. The difference between the groups is similar to that reported for the age of the respondents as there is a greater spread of the distribution towards the upper end in the programmer group. As can be seen in Figures 7.5 and 7.6, the web developer distribution for this variable demonstrates a longer tail to the right whereas the programmer distribution is slightly flatter and spread more evenly across the range.

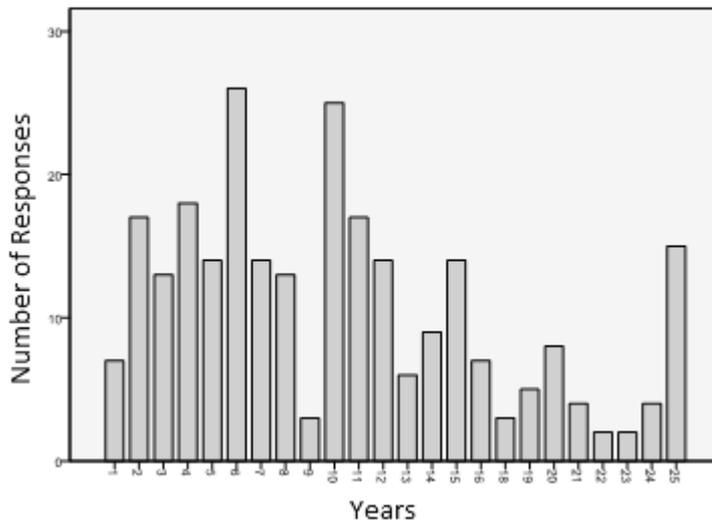


Figure 7.5 Number of years in the occupation for Programmer Group

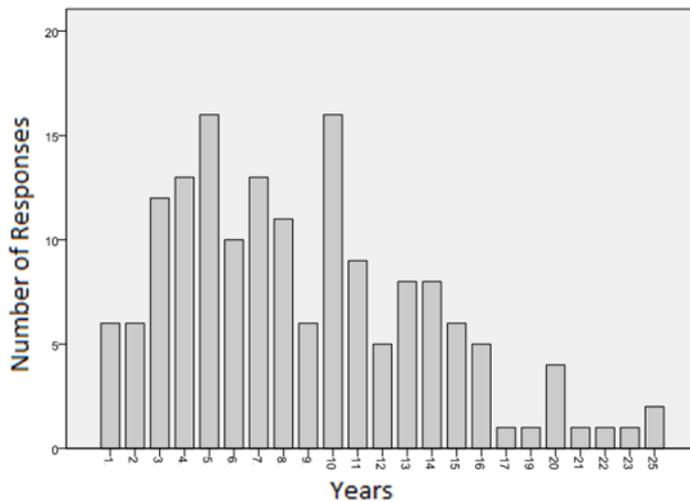


Figure 7.6 Number of years in the occupation for Web Developer Group

Once again this may be explained by the history of the technologies involved and thus the age of the occupation and the normal aging of the workforce congruent with the evolution of IT work.

### 7.313 Gender

There is very little difference between the gender of the respondents in each of the groups (Tables 7.5, 7.6), with 4.4% of programmers and 3.9% of web developers being female, which is slightly low compared to the percentage of women working across all IT occupations as previously discussed regarding the whole sample. There is no data readily available that details the gender balance in the specific occupational groups but it is suggested that this will be lower in software development roles than in administrative and project management roles when considering historic trends.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	246	94.6	96.1	96.1
	Female	10	3.8	3.9	100.0
	Total	256	98.5	100.0	
Missing	System	4	1.5		
Total		260	100.0		

Table 7.5 Gender for Programmer sample

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	153	94.4	95.6	95.6
	Female	7	4.3	4.4	100.0
	Total	160	98.8	100.0	
Missing	System	2	1.2		
Total		162	100.0		

Table 7.6 Gender for Web Developer sample

### 7.314 Country of residence

The country of residence responses across the two groups are very similar in profile to one another (Tables 7.7,7.8) and reflect the distribution of the complete, original sample which was detailed at the beginning of the chapter (Fig. 7.2). However, the proportion of responses from the UK and US is noticeably different across the two groups with US residents accounting for 46.9% of web developers with 6.8% from the UK compared to 35.1% of programmers being resident in the US and 18.9% from the UK. This is may be connected to the use of the BCS to advertise the survey in their regional magazine, as it would be more likely to have programmers as members than web developers as the researcher is aware from anecdotal evidence (from the exploratory study) that they tend to attract a more traditional membership of programmers and systems analysts than those using web based technologies.

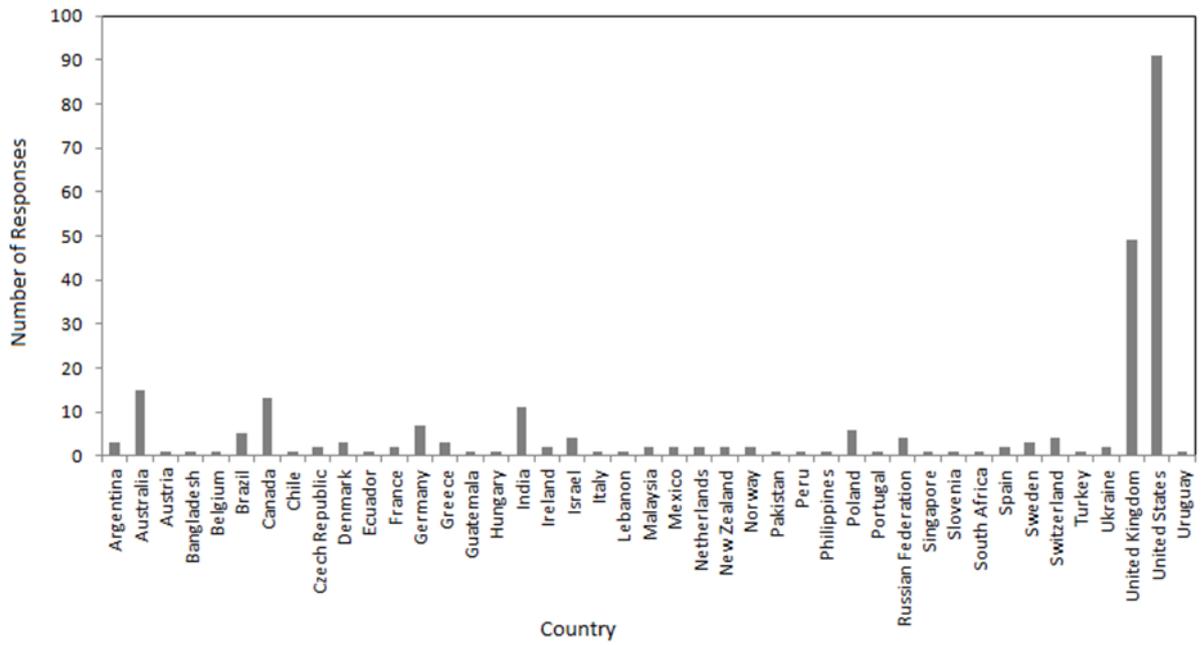


Figure 7.7 Country of residence for Programmer Group

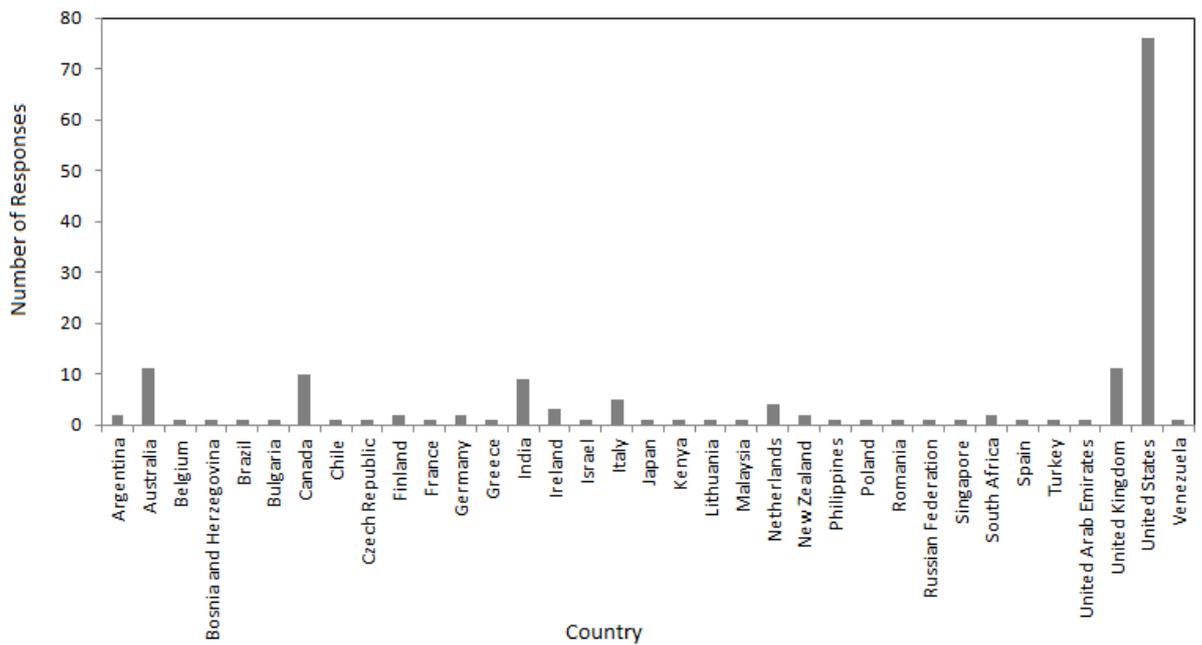


Figure 7.8 Country of Residence for Web Developer Group

### 7.315 Qualifications

There is very little difference in the two groups when examining the level and type of highest qualifications reported, with 47% in each group having an IT related UG qualification. The only notable differences between the groups, in terms of qualifications, is that there was a slightly higher

percentage of college qualifications as the highest achieved within the web developer groups of 12.3%, compared to 5.8% in the programmer group. This was also the case with professional qualification as the highest achieved at 3.1% for the web developers in contrast to 0.4% for the programmers. There were a higher number of PG qualifications (including IT and non-IT) in the programmer group of 30.6% compared to 21% in the web developer group. It is difficult to discern why this may be case without further exploration as to the types of qualifications and the prior educational experience of these workers. It is anticipated that further information regarding qualification and education associated with career choices may be derived from the qualitative study.

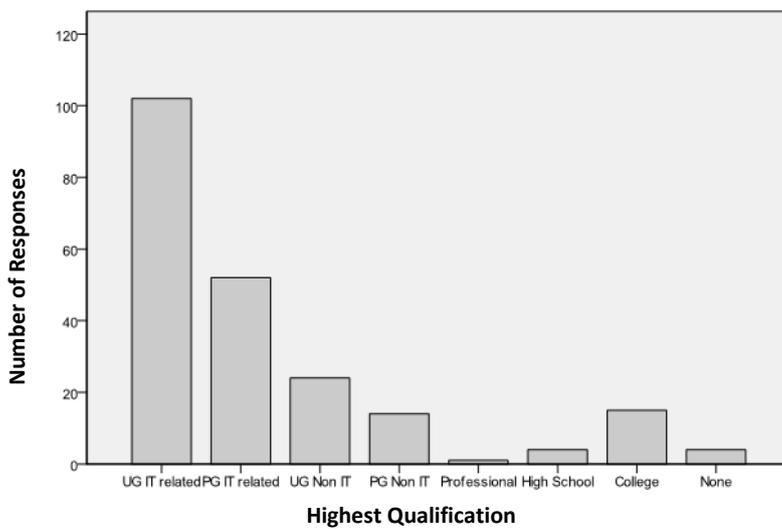


Figure 7.9 Highest qualification held in the programmer group

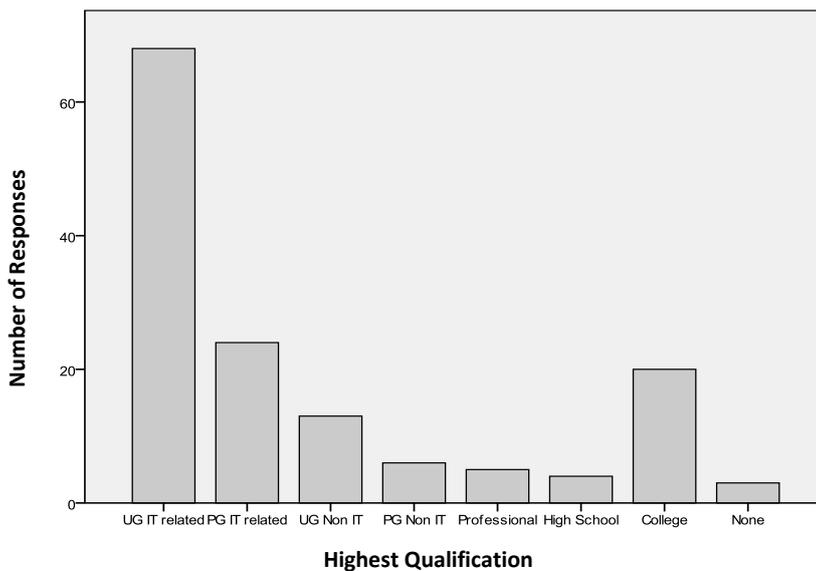


Figure 7.10 Highest qualification held in the web developer group

### 7.316 Organisational context

In order to understand these groups it is also important to broadly appreciate the context in which they work. To this end, questions were asked regarding the sector and the size of the organisation, alongside the number of organisations in which they had worked, which gives a sense of the level of mobility in the groups. It can be seen from Figs 7.11 and 7.12 that in both samples the predominant sector in which respondents work is Information Technology (programmers 53.3%, web developers 46.1%).

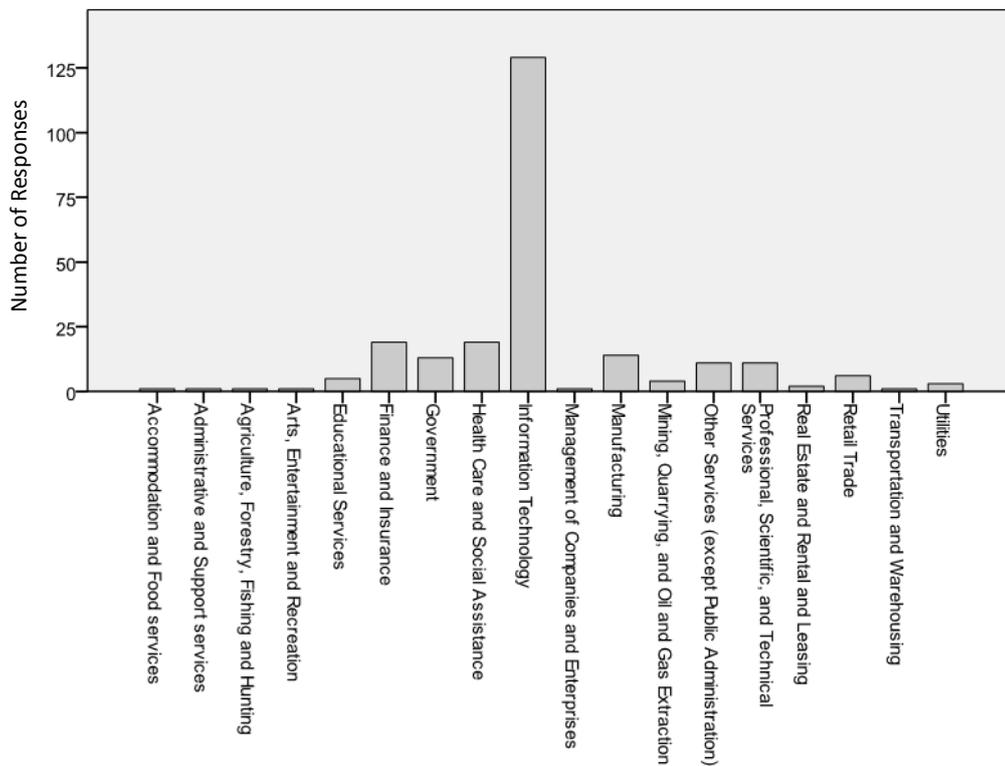


Figure 7.11 Sector in which employed for Programmer Group

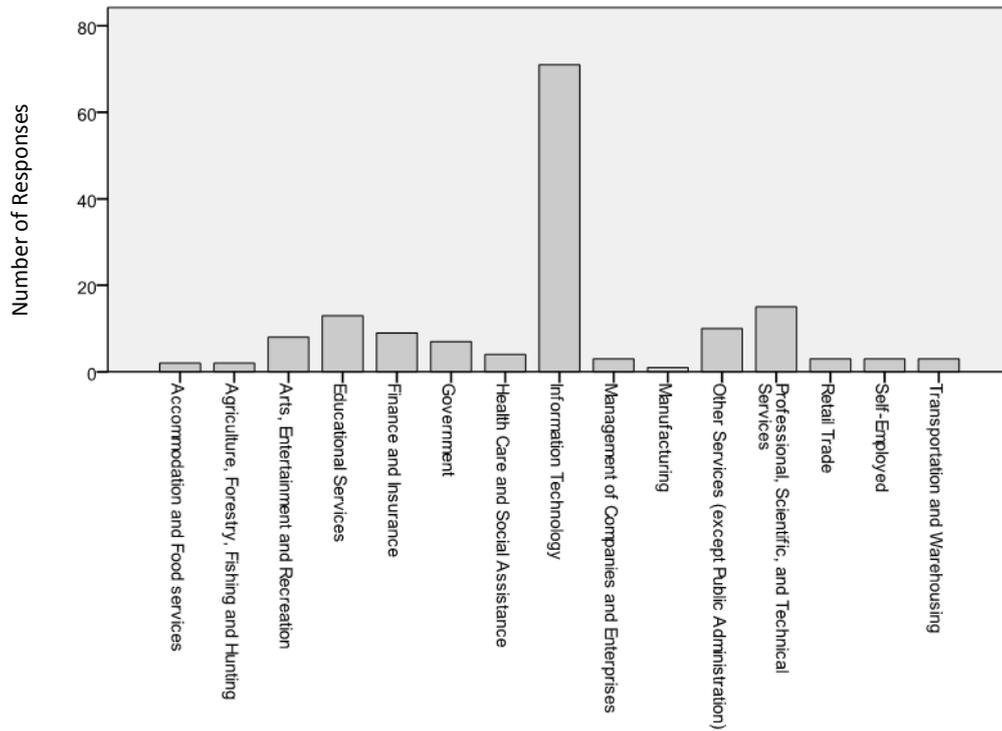


Figure 7.12 Sector in which employed for Web Developer Group

This suggests that the samples are comparable in terms of the extent to which these workers are working within the IT sector. There are no other significant features of the sample in relation to this variable that might affect further analysis of the data or prompt further discussion.

### 7.317 Organisation Size

The size of the organisation was measured in terms of the approximate numbers of employees. In relation to the size of the organisation, there appears to be a notable difference in the two groups with a higher proportion of programmers (20.7%) working for organisations with a large number of employees (over 10000) in contrast to 9.8% of web developers. 32% of web developers are employed in organisations with less than 20 employees whereas this figure is 19.8% for programmers (see Figs 7.13 and 7.14).

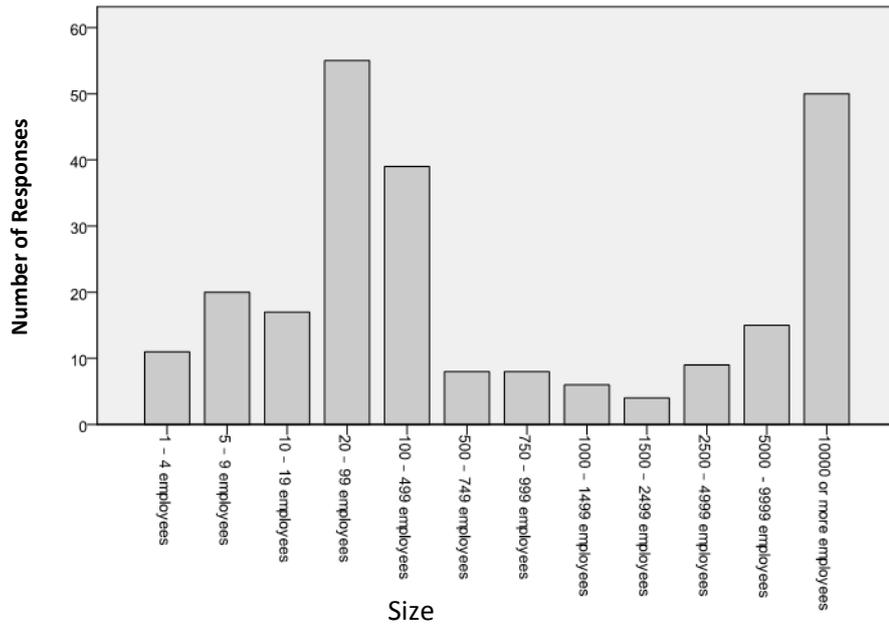


Figure 7.13 Organisation size for programmer group

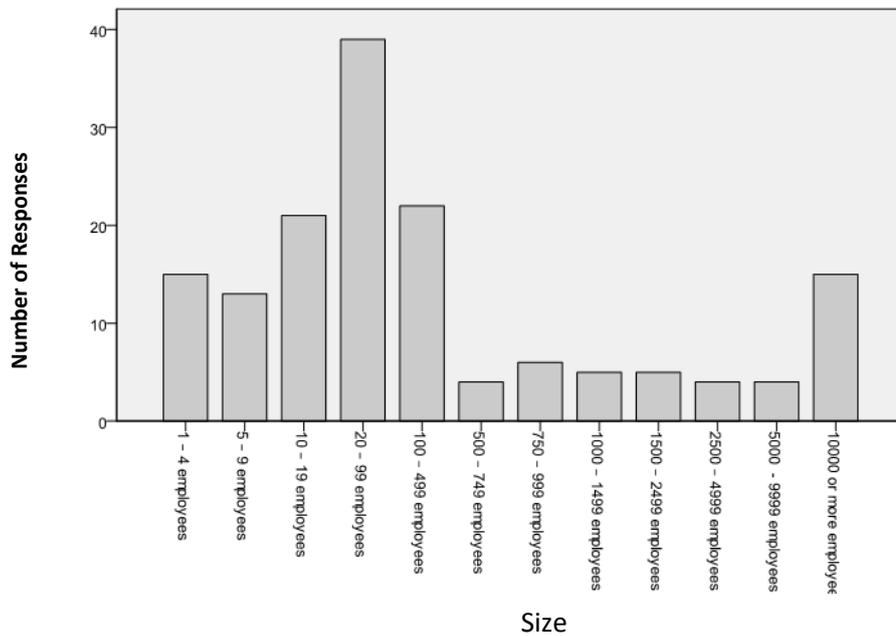


Figure 7.14 Organisation size for web developer group

It is unsurprising that the web developer data shows that there are higher numbers employed in small organisations as web development lends itself to smaller organisations, which has been the case over its 30 year history. Web development ‘shops’, as they are often referred to in the States, are agile and able to quickly adapt to technological and market shifts and there appears to be a

proliferation of owner-managers who set up their own development businesses with a band of other web developers as a collective of contractors (Barley and Kunda, 2004) akin to Handy's view of the loosely couple network, (Handy, 1993). The size of the organisation is likely to affect its culture and the levels of formality within it, particularly in respect of people management practices and systems, which are more likely to be ad hoc and reactive rather than formalised and strategic. Matters relating to organisational size, culture and formalisation of HR processes will be examined further in the qualitative study.

It is evident that there is little difference between the samples in terms of the demographics and data relating to the organisational context. However, as there were some differences noted regarding the age profile, the number of employees in the organisation and the level of qualification these were controlled for to ensure that there was no interaction effect. These variables were controlled for in the data analyses in order to assess whether there was any interaction effect. No effects were found in the testing of the hypotheses.

#### 7.4 Findings

In order to analyse the KWCM the hypotheses are taken in the order in which they are presented in the reconceptualisation of the model in Chapter 6. This allows the results to be presented clearly in line with the KWCM rather than according to the type of statistical test used. Therefore, the presentation of the findings and discussion begins with the analysis of the core job characteristics and the relationship with the psychological states, before examining the outcomes and the additional variables.

##### 7.41 Job Characteristics: Skill Variety, Task identity and Task Significance

Given the breadth of the role which is attributed to web development work and the multiple tasks that this group are seen to engage with it was hypothesised that:

*H14: Skill variety will account for the greatest amount of variance in experienced meaningfulness of work for web developers.*

Model Summary:

R	R Square	Adjusted R Square	Std. Error of the Estimate
.727	.528	.519	.82059

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	SE B	Beta		
Constant	.318	.366		.869	.386
Skill Variety	.362	.064	.356	5.687	.000
Task Identity	.190	.052	.214	3.682	.000
Task Significance	.347	.053	.397	6.538	.000

Table 7.7 Regression of Experienced Meaningfulness of Work onto Skill Variety, Task Variety and Task Significance for the Programmer Group

Model Summary:

R	R Square	Adjusted R Square	Std. Error of the Estimate
.690	.477	.458	.91040

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	SE B	Beta		
Constant	.722	.510		1.415	.161
Skill Variety	.507	.089	.510	5.725	.000
Task Identity	.028	.088	.029	.323	.747
Task Significance	.276	.066	.339	4.163	.000

Table 7.8 Regression of Experienced Meaningfulness of Work onto Skill Variety, Task Variety and Task Significance for the Web Developer Group

This hypothesis was accepted as skill variety was found to make the largest contribution to experienced meaningfulness of work (Beta= .51) for web developers, as suggested by the archetype literature pertaining to this role (Table 7.8). As the nature of the role is described as being one of multidisciplinary and boundary spanning it is unsurprising that experienced meaning should be comprised to such a large extent from skill variety within the job (Pressman, 1999; Tilley and Huang, 1999). It could be suggested therefore that this aspect of the job for web developers is essential in creating the psychological states that precede high outcomes. The precise nature of what shape this variety might take is indiscernible from this type of data but is examined further in the semi-structured interviews of Study 3, Chapter 8. It is interesting to note that whilst skill variety is significant in the model for the programmer group it does not account for as much variance in experienced meaningfulness. These findings demonstrate that there is a notable difference here

within the broader category of knowledge work, relating to the importance of variety in the work, which would not have been discerned using the broader archetypes.

Task identity was suggested in the literature to be of greater import to programmers due to the narrower focus of their role and the likelihood that they would be presented with tasks to do (SOC, 2010, Todd et al, 1995). It was therefore hypothesised:

*H15: Task identity will account for less variance in contributing to experienced meaningfulness of work for web developers than programmers*

Table 7.7 shows that, for the programmer sample, 51.9% of experienced meaningfulness of work can be explained by the model. The adjusted R square for the web developer group suggested that 45.8% of the variance in the dependent variable can be explained by the model in this instance. Both of the models are found to be statistically significant ( $p=.000$ ). The Beta Standardised Coefficients values reported for the programmer sample are all significant with Task Significance (beta = .397) making the strongest unique contribution to experienced meaningfulness of work with skill variety (beta=.356) making slightly less contribution and with Task Identity making the least contribution with a beta of .214. The part correlation coefficient squared indicated that task significance explains 12.96% of the variance in experienced meaningfulness of work, with skill variety having a unique contribution of 9.8% and task identity 4.12%. However, in the web developer group the beta standardised coefficients are not all significant as Task Identity has a reported significance of .747 which indicates that this is not making a significant unique contribution to experienced meaningfulness of work. Skill variety is making the largest contribution (beta=.510) with task significance making less of a contribution (beta = .339) to the dependent variable (DV). The part correlation coefficient squared shows that skill variety makes a 19.7% unique contribution to experienced meaningfulness with 10.4% unique contribution accounted for by task significance. Therefore the hypothesis (H15) is accepted that task identity contributes less to experienced meaningfulness of work for web developers than for programmers.

Task identity, that is, doing a task in its entirety and being able to see visible outcomes as a result of the work, was not found to contribute at all to web developers experienced meaningfulness of the work. This is likely to be attributable to the nature of the work and the sense that websites in themselves may be seen as the whole piece of work rather than a piece of development work which may be a small part of a much larger system. The task is perhaps not an appropriate unit of analysis

for web developers so much as it is for programmers. It may also be attributed to the stated multidisciplinary aspects of the work whereby web developers are potentially involved in a wider array of tasks which all contribute, to varying degrees, to the production of a web site. It may also be that the web site itself is seen and identified as the task, thereby elevating the notion of task to a macro level with lower level tasks becoming part of an holistic development task - the bigger endeavour of a functioning and usable website. Therefore, the notion of task may not be applicable in the same way between the two groups because of the nature of the work and the magnitude of the perceived task. It could also be suggested that this knowledge of and contribution to the bigger product of the website demonstrates a need to move to, in conceptualisations of (knowledge) work, the foci of the work as being something which is more expansive than was previously the case. The knowledge work literature alludes to this in Drucker's (1963; 1969) early discussions of knowledge work suggesting that the work is difficult for managers to identify and understand because they have little specialist knowledge. However, it may not be the lack of knowledge that is of import here but the understanding of the workers concept of task and its relative importance to managing performance. It could also be suggested that components of work for web developers may not always be conceived of as being discrete tasks which can be discerned as separate facets of the work. If web developers can be considered to be archetypal knowledge workers their understandings of task and the foci of their work need to be understood and appreciated more fully in order to determine the implications for management of these workers. From a broader, methodological perspective, this may be one of the difficulties of using a measure which is rooted in a different conceptualisation of work which may not be necessarily be applicable in its entirety to a contemporary setting. Even so, these results demonstrate that there is a distinction between the contribution that these core job characteristics make to experienced meaningfulness of work in programmers and web developers.

#### 7.42 Job Characteristics: Autonomy

In order to test the following hypothesis relating to autonomy the same set of analyses were applied to the data.

*H16: Autonomy will account for a greater amount of variance in experienced responsibility for outcomes of the work for web developers than programmers.*

Model Summary:

R	R Square	Adjusted R Square	Std. Error of the Estimate
.473	.224	.219	.81503

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	SE B	Beta		
Constant	3.445	.295		11.693	.000
Autonomy	.356	.053	.473	6.746	.000

Table 7.9 Regression of Experienced Responsibility onto Autonomy for the Programmer Group

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.517	.267	.259	.74847

Regression Table

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	SE B	Beta		
Constant	3.292	.405		8.133	.000
Autonomy	.399	.070	.517	5.698	.000

Table 7.10 of Experienced Responsibility onto Autonomy for the Web Developer Group

For each of the groups the adjusted R square showed a similar value demonstrating that 21.9% and 25.9% of the variance in experienced responsibility was accounted for by autonomy (Tables 7.9, 7.10). Therefore the hypothesis is rejected in that there is no great difference between the models for each of the groups. Whilst there is no difference in the results here it cannot be discounted that there may be variation in the way that autonomy is interpreted by each of the groups. The items in the scales speak broadly of freedom to decide how to do the work and ability to make own judgements but this can be interpreted in different ways depending upon the scope of the role and the experience of the incumbent. Whilst this hypothesis has been rejected in terms of the statistical report, the detail relating to the reference points for autonomy warrants further investigation. As suggested in Chapter 5 there may be a need to use differentiated autonomy variables (work scheduling, work methods and decision-making) to explore this more fully in future studies (Humphrey et al, 2007). It could be suggested that there are varying degrees of experienced autonomy which have very different parameters according to the role and organisation; for example, the ability to determine the technologies being used may be deemed to be representative of autonomy in one case whilst in another merely deciding the order in which to approach the work

may be considered to be autonomy. This suggests that autonomy, freedom and independence are not necessarily reflective of the magnitude and scope of the work or necessarily of the differences which may truly exist between these two groups. Perceptions of autonomy as a characteristic of the job may be similar but the actuality may be somewhat different. Once again the qualitative data should elucidate as to the scope of autonomy for these workers. As autonomy is considered to be such an integral facet of knowledge work and of knowledge workers experiences of their work (Davenport et al, 1996; Despres and Hiltrop, 1995; Elkjaer, 2000; Newell et al, 2002) it is essential to understand what is truly meant by autonomy in these occupations and also the impact that this may have upon the workers relationship with the organisation.

#### 7.43 Job Characteristics: Feedback

The final job characteristic to be examined in relation to its direct relationship with the critical psychological states was that of feedback. It was hypothesised that feedback from the job would make a greater contribution to knowledge of the actual results of the work activities for the programmer groups than for web developers.

##### Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.663	.439	.436	.85229

##### Regression Table

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	SE B	Beta		
Constant	2.103	.256		8.204	.000
Feedback	.582	.052	.663	11.126	.000

Table 7.11 Regression of Knowledge of the Results onto Feedback for the Programmer Group

##### Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.530	.280	.272	.88716

##### Regression Table

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	SE B	Beta		
Constant	2.864	.372		7.708	.000
Feedback	.442	.075	.530	5.890	.000

Table 7.12 Regression of Knowledge of the Results onto Feedback for the Web Developer Group

H17: Feedback from the job will account for a greater amount of variance in knowledge of the results work activities for programmers than for web developers.

The adjusted R square for the programmer group indicated that 43.6 % of the variance in knowledge of the actual results was accounted for by feedback from the job. For web developers this demonstrated that 27.2% of the variance was accounted for by feedback from the job. Thus hypothesis H17 is accepted as the programmer group results demonstrate that feedback from the job explains more variance in knowledge of the actual results. It could therefore be suggested that web developers are reliant on a different range of sources for their knowledge of the actual work. In order to test this knowledge of the actual results was regressed onto feedback from agents and feedback from job to determine which made the greatest contribution to knowledge of the actual results. The results show that for the programmers 51.9% of the variance in knowledge of the actual results was accounted for by the model with feedback from the job making the strongest unique contribution (beta= .454) and with agents contributing 36% to explaining knowledge of the actual results. In the web developer group 32.7% of the variance was attributed to feedback from the job and from agents with the former making the strongest unique contribution of 36.5% and the latter contributing slightly less with 29.8% contribution. This demonstrates that for the web developer group feedback (job and agents) accounts for less of the variance in knowledge of the results than in the programmers group. This may be linked to the nature of the role in that web developers require less direct feedback from the job and from others in determining the level of their performance as this is derived from another source. The scales refer to supervisors and co-workers, rather than external stakeholders and customers who could be seen as the primary source of feedback for web developers, as the product and therefore 'the results' are exposed to scrutiny from a range of different sources. For programmers there may be greater relevance in the questions asked as supervisors and co-workers are their direct source of feedback in actually determining their performance. Therefore a greater amount of variance in knowledge of results is explained by this model in the programmer group than for the web developer group.

#### 7.44 Relationships between core job characteristics and critical psychological states

On examination of the relationships in the model between the core job characteristics and the critical psychological states it was evident that there were differences between the two groups with regards to the contribution that each makes to the outcomes of the model. Each of the outcome

variables is discussed in order to assess the amount of variance which each of the psychological states accounts for in that variable.

#### Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.705	.497	.487	.60502

#### Regression Table

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	SE B	Beta		
Constant	1.867	.291		6.427	.000
Experienced Meaningfulness	.198	.053	.277	3.746	.000
Experienced Responsibility	.381	.071	.416	5.366	.000
Knowledge of Results	.090	.053	.121	1.706	.090

Table 7.13 Regression of Internal Work Motivation onto Experienced Meaningfulness of the Work, Experienced Responsibility and Knowledge of the Results for the Programmer Group

#### Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.620	.384	.363	.77072

#### Regression Table

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	SE B	Beta		
Constant	1.800	.533		3.378	.001
Experienced Meaningfulness	.058	.084	.074	.691	.492
Experienced Responsibility	.644	.127	.580	5.067	.000
Knowledge of Results	-0.12	.098	-0.13	-.119	.906

Table 7.14 Regression of Internal Work Motivation onto Experienced Meaningfulness of the Work, Experienced Responsibility and Knowledge of the Results for the Web Developer Group

For the programmers the three independent variables (IVs) accounted for 48.7% of the variance in internal work motivation, whereas in the web developer group this was found to be 36.3%. In the programmer group experienced responsibility of work was found to be making the strongest unique contribution to explaining internal work motivation (beta=.416) with experienced meaningfulness of

work making the next significant contribution ( $\beta = .277$ ). Knowledge of results was not found to be making a significant contribution to internal work motivation in the programmers. For the web developer group there is a similar result in relation to knowledge of results as it is not determined to be making a significantly unique contribution to internal work motivation. This is also the case for experienced meaningfulness of work in the web developers group. Therefore, the only variable which is making a unique contribution to explaining internal work motivation is experienced responsibility ( $\beta = .580$ ), which explains 17.98% of total variance. This leads to the acceptance of the hypothesis:

*H18: Experienced meaningfulness of the work will account for a greater amount of variance in internal work motivation for programmers than for web developers.*

These results suggest that there is a substantial difference in the way in which the psychological states account for the outcomes in the model compared to what would be expected (Humphreys et al, 2007). It is notable that knowledge of results makes no significant contribution to internal work motivation in either group but experienced responsibility is particularly important in explaining internal work motivation for web developers. Given the type of role which they are purported to have in the literature this is unsurprising, as they are thought to be imbued with greater decision making power and independence in determining the way in which work is carried out, which goes beyond that of merely prioritising predetermined tasks or choosing between a number of given alternatives. This perhaps returns the discussion to the need for a greater understating of what is meant by autonomy and consequently the impact that this might have upon experienced responsibility.

Growth Satisfaction is considered to be paramount to knowledge workers (Flood et al, 2001) and therefore the need for learning and development could be expected to have a profound effect on this variable. As there is little discernible difference between the two archetypes in this facet of knowledge work (in terms of the literature) this analysis does not address a particular hypothesis relating to difference or similarity between the groups. However, it is considered that this should be evaluated as part of the model in order to increase knowledge and understanding in this regard.

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.750	.563	.553	.8874

Regression Table

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	SE B	Beta		
Constant	.275	.454		.605	.546
Experienced Meaningfulness	.715	.083	.637	8.665	.000
Experienced Responsibility	.148	.111	.103	1.330	.186
Knowledge of Results	.093	.083	.080	1.128	.261

Table 7.15 Regression of Growth Satisfaction onto Experienced Meaningfulness of the Work, Experienced Responsibility and Knowledge of the Results for the Programmer Group

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.774	.599	.583	.92781

Regression Table

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	SE B	Beta		
Constant	-.603	.698		-.865	.390
Experienced Meaningfulness	.655	.109	.564	5.987	.000
Experienced Responsibility	.579	.166	.350	3.476	.001
Knowledge of Results	-.119	.129	-.086	-.928	.357

Table 7.16 Regression of Growth Satisfaction onto Experienced Meaningfulness of the Work, Experienced Responsibility and Knowledge of the Results for the Web Developer Group

The adjusted R square figures show that the psychological states account for 55.3% of the model for the programmers and 58.3% for the web developer group. For both groups experienced meaningfulness of work was the strongest contributor to predicting growth satisfaction (programmers beta = .637; web developers beta =.564) and for the programmers neither of the other independent variables were significant in the model. Experienced responsibility made a 35% contribution to the dependent variable which accounted for 6.55% of the unique variance for the

web developer groups. It is interesting to note that experienced responsibility is significant in contributing to growth satisfaction which may be accounted for by the types of activity within web development which relate to autonomy (the antecedent of experienced responsibility). Once again, the nature of autonomy within the role may distinguish it from that experienced by programmers and may be the reason why it is significant in determining growth satisfaction for web developers as it is an intrinsic part of the job rather than a method of undertaking prescribed tasks. Web developers' growth satisfaction therefore is contingent upon experienced responsibility which may be ascribed to autonomy, in its broader sense, whereby the job affords web developers the latitude to make decisions and take responsibility in a way that programmers are not. This suggests that the link between autonomy, responsibility and growth are located in the wider array of tasks for web developers, whereas for programmers, growth satisfaction could be suggested to have more to do with 'the fight between man and the machine' (Chapter 4, Interviewee SDC2). The assertion from the literature (both knowledge work and occupational) is that growth, learning, pursuit of knowledge and autonomy are all present in these knowledge worker archetypes but to varying degrees and with different reference points. Terms, such as autonomy and decision-making, do not sufficiently describe the nature of the work and the variances therein relating to role and context. It could therefore be suggested that the terminology in knowledge work needs to be expanded in order to fully appreciate the intricacies of these terms in describing the nature of the work and the impact that it may have upon organisations and management practices. This can only be achieved through the examination of these roles in finer detail in Study 3.

#### 7.45 Relationships between critical psychological states and the outcome variables

In examining the relationships between the psychological states and general job satisfaction the adjusted R square figures (Tables 7.17 and 7.18) shows that the psychological states account for 57.7% variance in the model for the programmers and 60.6% for the web developer group. The contribution of the independent variables to general job satisfaction is similar to those results reported for growth satisfaction, in that experienced meaningfulness makes the strongest contribution in both cases (programmers  $\beta = .601$ ; web developers  $\beta = .567$ ). The programmer results indicate that knowledge of results also make a significant contribution to general job satisfaction ( $\beta = .130$ ; part correlation squared = .104), albeit only 1.1% unique contribution) whereas for web developers experienced responsibility makes the next largest, significant contribution ( $\beta = .245$ ; part correlation squared = 0.032).

### Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.765	.585	.577	.85406

### Regression Table

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	SE B	Beta		
Constant	-.214	.410		-.521	.603
Experienced Meaningfulness	.667	.074	.601	8.958	.000
Experienced Responsibility	.180	.100	.126	1.794	.075
Knowledge of Results	.151	.075	.130	2.019	.045

Table 7.17 Regression of General Job Satisfaction onto Experienced Meaningfulness of the Work, Experienced Responsibility and Knowledge of the Results for the Programmer Group

### Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.787	.619	.606	.90510

### Regression Table

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	SE B	Beta		
Constant	-1.167	.626		-1.865	.065
Experienced Meaningfulness	.661	.098	.567	6.731	.000
Experienced Responsibility	.407	.149	.245	2.726	.008
Knowledge of Results	.107	.115	.077	.929	.355

Table 7.18 Regression of General Job Satisfaction onto Experienced Meaningfulness of the Work, Experienced Responsibility and Knowledge of the Results for the Web Developer Group

This reflects the multiple regression findings related to internal work motivation and growth satisfaction indicating that for programmers experienced meaningfulness is a stronger predictor whereas for web developers experienced responsibility is a stronger predictor. Therefore H19 is accepted.

*H19: Experienced responsibility for outcomes of the work will account for a greater amount of variance in job satisfaction for web developers than for programmers*

#### 7.46 Identification

The following hypotheses were tested using independent samples t-tests with the results outlined below in tables 7.19 and 7.20. The non-parametric alternative of Mann-Whitney tests were also conducted in order to establish the differences between the two groups given the lower sample size.

*H20 Web developers will identify more strongly with their team than will programmers*

*H21 Web Developers will identify more strongly with their organisation than will programmers*

*H22 Programmers will identify more strongly with their occupation than will web developers*

Variable	Group	N	Mean	Std. Deviation	Std. Error Mean
Team Identification	Programmers	125	4.7120	1.36675	.12225
	Web Developers	73	4.4795	1.43478	.16793
Organisational Identification	Programmers	125	3.7520	1.44052	.12884
	Web Developers	73	3.5342	1.49148	.17456
Community Identification	Programmers	124	4.3710	1.50591	.13523
	Web Developers	73	4.1644	1.55469	.18196
Professional Identification	Programmers	125	5.4240	1.16580	.10427
	Web Developers	73	5.2877	1.27453	.14917

Table 7.19 Descriptive statistics for the Identification Variables

	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	Sig.	t	df	Sig. (2 tailed)	Mean difference	Std Error Difference
Team Identification	.003	.958	1.134	196	.258	.23255	.20507
Organisational Identification	0.28	.867	1.013	196	.312	.21775	.21498
Community Identification	.453	.502	.919	195	.359	.20658	.22484
Professional Identification	.086	.770	.767	196	.444	.13633	.17778

Equal Variances Assumed

Table 7.20 Independent samples t-test for Identification Variables

As table 7.19 illustrates there were found to be no significant differences between the mean scores reported in terms of strength of identification between web developers and programmers related to any of the foci. The effects sizes were also calculated and all were below 1%. Thus hypotheses 20, 21,

and 22 were all rejected contrary to what the literature would suggest. It is interesting to note that the mean was considerably higher for professional identification in both groups with organizational identification being relatively low compared to team and community identification means. The web development sample was reported to consist of a larger proportion of respondents from smaller firms, that is, those employing less than 20 people (32 % compared to 19.8% for programmers). At the other end of the distribution the programmers had a higher proportion of respondents (20.7%) employed in extremely large organisations of over 10000 employees in comparison with web developers (9.8%). These elements were controlled for in the analysis of the data and none were found to have an interaction effect. The literature gives little indication as to the effect that the organisational context may have upon identification of employees particularly in relation to the foci of identification. It is suggested that there may be significant difference in relation to the strength and pervasiveness of the prevailing culture and consequently in the prevalence of systematic HR practices and processes. The size of the organisation and the team in which an employee is working will impact upon the extent to which either of these foci are readily identifiable with. In an organisation of 15 people the team and organisation are synonymous with one another, in contrast, a team of 25 people nested in a department of 150 in global organisation of over 100000 employees (such as IBM) will require different reference points as to what constitutes the team and the organisation. It may be much easier for an employee to experience disquiet in terms of the wider organisation's values or modus operandi but identify strongly with the team and therefore attribute the desirable characteristics to the organisation when questioned in order to avoid dissonance. The issue of organisational context therefore obfuscates the seemingly clear direction from literature regarding the breadth of the web development role and the type of identification that it would be expected to produce. Despite the hypotheses having been rejected, it is suggested that the organisational context should be explored further in the subsequent study to determine the extent to which the size of the organisation impacts upon the identity and focus of identification of these workers. Whilst no distinction may be directly evident here between the archetypes (at this more highly granulated level), the overarching experience of both of these groups may afford an opportunity to contribute to the broader conceptualisations of knowledge work outlined earlier in this thesis.

It was hypothesised, due to the role characteristics reported in the literature (Mael and Ashforth, 1992; Pressman, 1995), that team identification would be significant in affecting the outcomes of job satisfaction for web developers as this was deemed to be a clear foci of identification given their perceived role as boundary spanners.

H23: The moderating effect of team identification on the relationship between the core job characteristics (MPS) and the outcomes will be greater for web developers than for programmers.

The moderation effect of team identification was tested using multiple regression analysis with the inclusion of the moderation variables.

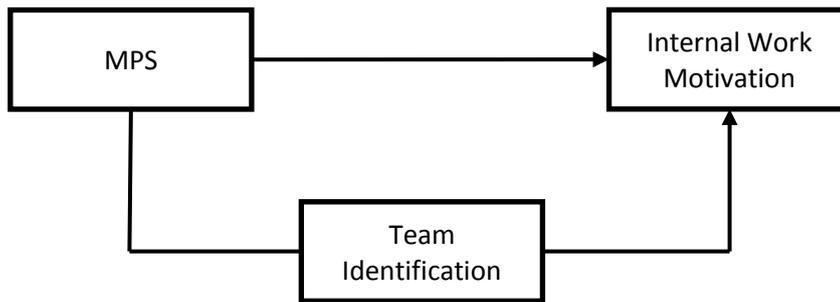


Figure 7.15 The moderation effect of team identification

Model Summary<sup>c</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.559 <sup>a</sup>	.313	.301	.71010
2	.581 <sup>b</sup>	.338	.321	.69990

a. Predictors: (Constant), Team Identification, MPS

b. Predictors: (Constant), Team Identification, MPS, Moderator MPS x Team Identification

c. Dependent Variable: Internal Work Motivation

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	SE B	Beta		
1	Constant	2.485	.342		7.276	.000
	MPS	.009	.002	.493	6.214	.000
	Team Identification	.190	.075	.200	2.523	.013
2	Constant	1.011	.648		1.561	.121
	MPS	.021	.005	1.111	4.528	.000
	Identification	.512	.142	.538	3.609	.000
	MPS x Identification	-.002	.001	-.840	-2.653	.009

Table 7.21 Multiple Regression Analysis of Moderating Effect of Team Identification on the relationship between MPS and Internal Work Motivation in the Programmer Group

Model Summary<sup>c</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.394 <sup>a</sup>	.155	.131	.71683
2	.402 <sup>b</sup>	.162	.125	..71914

a. Predictors: (Constant), Team Identification, MPS

b. Predictors: (Constant), Team Identification, MPS, Moderator MPS x Team Identification

c. Dependent Variable: Internal Work Motivation

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	SE B	Beta		
1	Constant	4.627	.296		15.629	.000
	MPS	.003	.001	.231	1.956	.055
	Team Identification	..132	.063	.248	2.103	.039
2	Constant	4.270	.563		7.590	.000
	MPS	.005	.003	.423	.139	.139
	Identification	.223	.137	.419	.108	.108
	MPS x Identification	.001	.001	-.309	.458	-.458

Table 7.22 Multiple Regression Analysis of Moderating Effect of Team Identification on the relationship between MPS and Internal Work Motivation in the Web Developer Group

The tests were run for each of the outcome variables in the JCM commencing with internal work motivation as the outcome variable. For the programmer group the results were significant and, using the adjusted R square figure there was a demonstrable increase in the amount of variance accounted for in the model after the moderator variable of team identification was entered (increasing from .301 to .321). The difference between these two score indicates that team identification accounts for an additional 2% of the variance in internal work motivation. All three of the variables in the second model make a statistically significant contribution unlike within the web developer group where the model using adjusted R square reduces from .131 to .125 with the inclusion of the moderator. The results in the coefficients table also show that the moderator is not significant (p=.458).

Further analysis was undertaken using growth satisfaction as the dependent variable to test the model in Figure 7.16. Team identification was found to moderate between MPS and growth

satisfaction for both groups making a marginally greater contribution to the amount of variation in the model in the web developer group (part correlation squared .068) compared to in the programmer model (part correlation squared = .04)

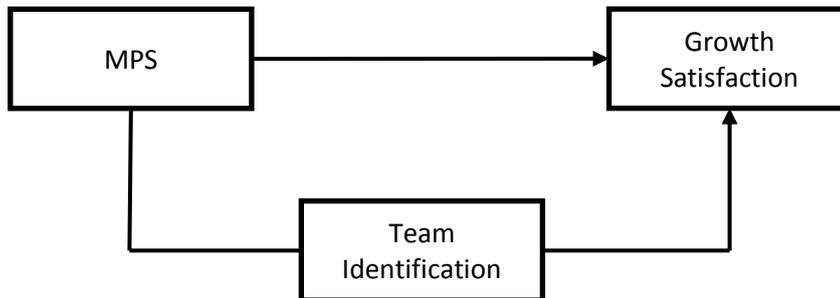


Figure 7.16 The moderation effect of Growth Satisfaction

Model Summary<sup>c</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.706 <sup>a</sup>	.499	.491	.95433
2	.735 <sup>b</sup>	.540	.528	.91848

a. Predictors: (Constant), Team Identification, MPS

b. Predictors: (Constant), Team Identification, MPS, Moderator MPS x Team Identification

c. Dependent Variable: Growth Satisfaction

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	SE B	Beta		
1	Constant	2.644	.313		8.455	.000
	MPS	.012	.001	.630	8.922	.000
	Team Identification	.146	.069	.150	2.117	.036
2	Constant	1.003	.585		1.714	.089
	MPS	.025	.004	1.298	6.034	.000
	Team Identification	.504	.128	.515	3.939	.000
	MPS x Team Identification	-.003	.001	-.909	-3.272	.001

Table 7.23 Multiple Regression Analysis of Moderating Effect of Team Identification on the relationship between MPS and Growth Satisfaction in the Programmer Group

Model Summary<sup>c</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.740 <sup>a</sup>	.547	.534	.94863
2	.785 <sup>b</sup>	.616	.599	.88030

a. Predictors: (Constant), Team Identification, MPS

b. Predictors: (Constant), Team Identification, MPS, Moderator MPS x Team Identification

c. Dependent Variable: Growth Satisfaction

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	SE B	Beta		
1	Constant	2.102	.392		5.365	.000
	MPS	.011	.002	.545	6.306	.000
	Team Identification	.332	.083	.345	3.989	.000
2	Constant	.065	.689		.095	.925
	MPS	.024	.004	1.150	6.011	.000
	Team Identification	.851	.168	.884	5.069	.000
	MPS x Identification	-.003	.001	-.976	-3.482	.001

Table 7.24 Multiple Regression Analysis of Moderating Effect of Team Identification on the relationship between MPS and Growth Satisfaction in the Web Developer Group

In examining the moderation effect of team identification on general satisfaction (see tables 7.25 and 7.26) it was found that the adjusted R square increased in both groups after its inclusion (.356 increased to .387 in programmer group; .453 to .485 in web developer group).

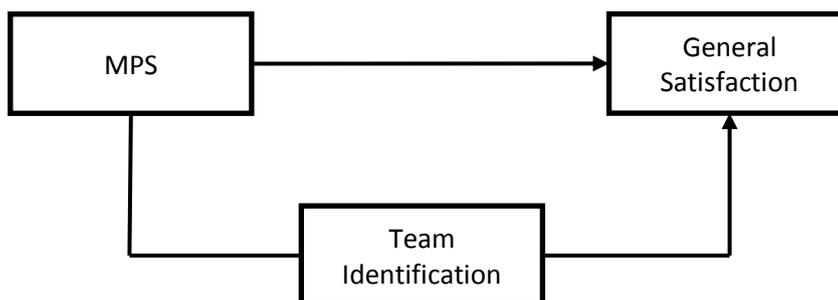


Figure 7.17 The moderation effect of Team Identification

Model Summary<sup>c</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.606 <sup>a</sup>	.367	.356	1.04235
2	.634 <sup>b</sup>	.401	.387	1.01748

a. Predictors: (Constant), Team Identification, MPS

b. Predictors: (Constant), Team Identification, MPS, Moderator MPS x Team Identification

c. Dependent Variable: General Job Satisfaction

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	SE B	Beta		
1	Constant	2.485	.342		7.276	.000
	MPS	.009	.002	.493	6.214	.000
	Team Identification	.190	.075	.200	2.523	.013
2	Constant	1.011	.648		1.561	.121
	MPS	.021	.005	1.111	4.528	.000
	Team Identification	.512	.142	.538	3.609	.000
	MPS x Team Identification	-.002	.001	-.840	-2.653	.009

Table 7.25 Multiple Regression Analysis of Moderating Effect of Team Identification on the relationship between MPS and General Job Satisfaction in the Programmer Group

Model Summary<sup>c</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.684 <sup>a</sup>	.468	.453	1.01804
2	.712 <sup>b</sup>	.507	.485	.98772

a. Predictors: (Constant), Team Identification, MPS

b. Predictors: (Constant), Team Identification, MPS, Moderator MPS x Team Identification

c. Dependent Variable: General Job Satisfaction

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	SE B	Beta		
1	Constant	1.865	.420		4.436	.000
	MPS	.009	.002	.450	4.804	.000
	Team Identification	.364	.089	.382	4.081	.000
2	Constant	.354	.773		.458	.648
	MPS	.019	.004	.903	4.166	.000
	Team Identification	.750	.188	.786	3.980	.000
	MPS x Identification	1.865	.420		4.436	.000

Table 7.26 Multiple Regression Analysis of Moderating Effect of Team Identification on the relationship between MPS and General Job Satisfaction in the Web Developer Group

Therefore, the hypothesis (H23) is partially accepted in that the results show that the moderator variable accounts for a greater amount of variance in the model in the way that team identification moderates the relationship between MPS and growth/general satisfaction (according to the part correlation figures) although it should be noted that this difference is not particularly great.

However, in the model where internal work motivation is the dependent variable there is no moderation effect detected for the web developer group indicating the converse of the hypothesis to be true. That is, the motivating potential score of the job predicts internal work motivation better with the inclusion of team identification in the programmer group. The boundary spanning nature of the work for web developers (advocacy on behalf of the team etc), suggested that team identification would demonstrate a moderating effect on the outcomes. As this is not the case it may be that the lack of impact upon internal motivation is due to the broader organisational remit that web developers have (in contrast to the programmers) whereby internal work motivation is unaffected by team identification. Once again, this suggests that team identification is of importance to the programmer group and should therefore be examined as to the implications for managing these workers.

#### 7.47 Creativity

With regards to the t-test results, there was no evidence to suggest that there was any significant difference between the mean scores of the programmers and web developers in problem identification, information searching activities or idea generation activities.

Variable	Group	N	Mean	Std. Deviation	Std. Error Mean
Problem Identification	Programmers	126	4.2302	.48528	.04323
	Web Developers	70	4.2619	.52288	.06250
Information Searching	Programmers	126	4.0344	.63747	.05679
	Web Developers	70	4.1619	.68040	.08132
Idea Generation	Programmers	126	3.5548	.65392	.05826
	Web Developers	70	3.5850	.72138	.08622

	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	Sig.	t	df	Sig. (2 tailed)	Mean difference	Std Error Difference
Problem Identification	.069	.793	-.427	194	.670	-.03175	.07438
Information Searching	1.715	.192	-1.310	194	.192	-.12751	.09735
Idea Generation	.244	.622	-.299	194	.765	-.03024	.10117

Equal Variances Assumed

Table 7.27 T-tests for CPE Variables

Therefore hypotheses H24 and H25 as follows were rejected:

*H24: Programmers will report higher engagement in problem identification and information searching activities than web developers*

*H25: Web developers will report higher engagement in idea generation activities than programmers*

This may suggest that the scale was not sensitive enough to detect the variations in terms of frequency and intensity with which these activities are engaged with. For example, it may be the case that programmers engage in more algorithmic activities for a greater proportion of their time than in heuristic work but this would not be detected from the responses to these questions. The nature of creativity and problem solving must therefore be examined in greater depth in the final study in order to determine whether there is any distinction between the types of creative activities engaged in. Even if there is no distinction, further research may elucidate as to why there is no discernible difference in the results within the quantitative aspect of the study.

*H26: The moderating effect of ideas generation on the relationship between the core job characteristics and the outcomes will be higher for web developers than for programmers.*

This hypothesis was rejected as the regression analysis demonstrated that engagement in ideas generation was found to be not significant in moderating the relationship between the MPS and any of the JCM outcomes in either the programmer or the web developer group. In all calculations the adjusted R square value decreased for Model 2 and the beta scores were not found to be significant for the moderator variables. It could be suggested that the place of this variable in the model was perhaps incorrect, in that it would have been more appropriate to include it as it forms part of the job characteristics rather than moderating between the job characteristics and the outcome variables. This was proposed in the original KWCM but was then altered given the nature of the differences discussed between programmers and web developers.

#### 7.48 Goal orientation

It can be seen from the significance figure in the t-test report table 7.28 below that there were no significant differences found between the programmer and web developer samples. Learning goal orientation ( $t(197)=.601$ ,  $p>.05$ ,  $r=.04$ ) was not significant and demonstrated extremely low effect size and avoid goal orientation ( $t(197)=-.738$ ,  $p>.05$ ,  $r=.052$ ) results demonstrated no significance and similarly low effect size. Therefore, programmers were not found to have a higher avoid orientation than web developers from the t-tests therefore the hypothesis was rejected:

*H27: Programmers will report a higher avoid goal orientation than web developers*

Variable	Group	N	Mean	Std. Deviation	Std. Error Mean
Learning Goal Orientation	Programmers	128	1.7578	.70751	.06254
	Web Developers	71	1.6930	.76706	.09103
Avoid Goal Orientation	Programmers	128	4.5189	.88940	.07861
	Web Developers	71	4.6127	.79932	.09486
Prove Goal Orientation	Programmers	128	3.1465	.97938	.08657
	Web Developers	71	2.7664	1.09957	.13049

Table 7.28 T-tests for GO Variables

	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	Sig.	t	df	Sig. (2 tailed)	Mean difference	Std Error Difference
Learning Goal Orientation	.098	.755	.601	197	.549	.06485	.10791
Avoid Goal Orientation	1.702	.193	-.738	197	.461	-.09380	.12703
Prove Goal Orientation	.586	.445	2.509	197	.013	.38005	.15148

Equal Variances Assumed

Table 7.29 T-tests for GO Variables

Similarly, H28 was rejected as the beta values were found not to be significant for the moderator variables in either of the groups for any of the JCM outcome variables.

*H28: The moderating effect of avoid orientation on the relationship between the core job characteristics and the outcomes will be higher for programmers than for web developers*

Nor were the programmers found to have a higher prove orientation than web developers as was hypothesised:

*H29: Programmers will report a higher prove orientation than web developers*

Whilst a significant difference in prove orientation was found between web developers and programmers in the t-test ( $p=.013$ ), the web developers reported a higher mean prove orientation as demonstrated in Table 7.29 above (the variable is reverse scored). Therefore a distinction was found to be present but this was within the web developer group rather than in the programmer group. Whilst this was significant it was also shown to have a relatively low effect size ( $t(197)=2.509$ ,  $p>0.5$ ,  $r=.052$ ). This could suggest that the motivation for proving one's competence may be different

dependent upon the context and the role being performed thereby requiring different criteria for definition. In the formation of the hypotheses the literature was used to support the claim that the need to prove competence was fundamentally important to the programmer due to the specialisation and depth of the typical work undertaken. The literature suggested that the need to prove skill and knowledge would be imperative to maintaining the expert identity of the programmer (Todd et al, 1995). It may be that the breadth of the web developer role creates a requirement for web developers to prove their expertise to a wider audience. The literature pertaining to web developers suggests that they are generally familiar with exposure to a broader range of scrutineers, both intra and extra-organisational, and therefore this is a context in which they may need to prove their capabilities, thus explaining their goal orientation report. There were no differences discerned from the data in terms of learning or avoid orientations between programmers and web developers so it may be that this is symptomatic of the role of the latter groups. However, it may be that this propensity to want to prove themselves in goal directed behaviour predisposes web developers to the role, rather than assigning causality to the role itself. The moderating role of prove orientation was next tested in relation to hypothesis H30.

*H30: The moderating effect of prove orientation on the relationship between the core job characteristics and the outcome will be greater for programmers than for web developers*

There were found to be no moderating effects of prove orientation between MPS and the JCM outcomes for either of the groups with the exception of the results shown below in table 7.30 whereby Prove orientation was found to moderate the relationship between MPS and internal work motivation in the programmer group accounting for 2.34% of variance in the model (part correlation squared).

Model Summary<sup>c</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.567 <sup>a</sup>	.321	.310	.70198
2	.587 <sup>b</sup>	.345	.329	.69250

a. Predictors: (Constant), Prove Orientation, MPS

b. Predictors: (Constant), Prove Orientation, MPS, Moderator MPS x Prove Orientation

c. Dependent Variable: Internal Work Motivation

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	SE B	Beta		
1	Constant	4.547	.251		18.094	.000
	MPS	.007	.001	.554	7.509	.000
	Prove Orientation	-.078	.064	-.090	-1.218	.225
2	Constant	5.358	.457		11.713	.000
	MPS	.001	.003	.077	.323	.747
	Prove Orientation	-.335	.137	-.388	-2.440	.016
	MPS x Prove Orientation	.002	.001	.569	2.109	.037

Table 7.30 Multiple Regression Analysis of Moderating Effect of Prove Orientation on the relationship between MPS and Internal Work Motivation in the Programmer Group

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.389 <sup>a</sup>	.151	.126	.85527
2	.389 <sup>b</sup>	.151	.113	.86138

a. Predictors: (Constant), Prove Orientation, MPS

b. Predictors: (Constant), Prove Orientation, MPS, Moderator MPS x Prove Orientation

c. Dependent Variable: Internal Work Motivation

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	SE B	Beta		
1	Constant	4.808	.354		13.586	.000
	MPS	.005	.002	.388	3.476	.001
	Prove Orientation	-.005	.093	-.006	-.050	.960
2	Constant	4.709	.622		7.569	.000
	MPS	.006	.004	.439	1.538	.129
	Prove Orientation	.035	.224	.042	.156	.877
	MPS x Prove Orientation	.000	.001	-.073	-.194	.847

Table 7.31 Multiple Regression Analysis of Moderating Effect of Prove Orientation on the relationship between MPS and Internal Work Motivation in the Web Developer Group

This seems to somewhat contradict the findings of the t-tests which demonstrated that web developers had a stronger prove orientation score than programmers as these results suggest that the prove goal orientation moderates significantly for the programmer group in predicting internal work motivation but no such relationship is evident for web developers. It does have a very small

effect on the model and given the absence of any extant literature specifically in this regard it is suggested that this is explored further in the qualitative study.

Due to the rate of change and technological innovation both groups were surmised to have an intrinsic similarity in their desire to learn as part of the ongoing requirements of the job, which would be characteristic of the broad knowledge work archetype. There were no discernible differences in the literature relating to programmers and web developers and this was borne out by the t-test findings previously detailed in Table 7.29. Therefore hypothesis H31 was accepted.

*H31: There will be no difference between the web developers and programmers in their learning orientation*

#### 7.49 Commitment

After examining the t-test data reported below there was found to be no evidence to support the hypothesis that web developers experience higher affective and normative commitment than programmers

*H32: Web developers will report higher affective commitment and normative commitment than programmers*

Variable	Group	N	Mean	Std. Deviation	Std. Error Mean
Affective Commitment	Programmers	132	3.9843	1.54256	.13426
	Web Developers	75	3.8733	1.52626	.17624
Continuance Commitment	Programmers	132	4.6967	1.27132	.11065
	Web Developers	75	4.5956	1.21557	.14036
Normative Commitment	Programmers	132	4.3308	1.43259	.12469
	Web Developers	75	4.2356	1.49426	.17254

	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	Sig.	t	df	Sig. (2 tailed)	Mean difference	Std Error Difference
Affective Commitment	.004	.950	.500	205	.618	.11101	.22221
Continuance Commitment	.121	.729	.559	205	.577	.10116	.18096
Normative Commitment	.145	.703	.453	205	.651	.09525	.21041

Equal Variances Assumed

Table 7.32 T-test results for commitment variables

This hypothesis was suggested to be relevant due to the boundary spanning role which web developers tend to take on in comparison to programmers whose experiences of the organisation are reported to be somewhat narrower, and are frequently mediated through their relationship with their team and their supervisors (Pressman, 1999). It is apparent therefore that the nature of the role in terms of exposure to the broad organisation is not reflected in higher commitment. There may however be differing reasons for this which cannot be substantiated as the tests do not establish causality but only comparison between the means of the two groups. Whilst the hypotheses relating to moderation will be tested later in this chapter it should be said that it remains difficult to adequately discern the extent to which commitment and identification (across a variety of foci) are related and can be adequately differentiated. The results reported here do not provide, nor were expected to provide, a complete and comprehensive picture of the model and the relationships but go to use it as a framework to form part of the picture of a more comprehensive view of the knowledge work domain.

#### 7.491 Affective commitment

As part of the additions made to the JCM in the proposed model other proposed outcomes were affective commitment and high organisational identification, although the latter is also included as a potential moderator. Affective commitment was suggested to be an important outcome variable within Humphrey et al's (2007) work as part of the attitudinal outcomes and also derived from the results of the exploratory study. Thus, whilst no hypothesis has been established in this regard relating to the two groups of workers, an analysis was undertaken to examine the model accordingly.

#### Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.598	.357	.342	1.25098

#### Regression Table

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	SE B	Beta		
Constant	8.726	.662		13.184	.000
Experienced Meaningfulness	-.578	.120	-.433	-4.809	.000
Experienced Responsibility	-.268	.162	-.160	-1.657	.100
Knowledge of Results	-.094	.121	-.069	-.776	.439

Table 7.33 Regression of Affective Commitment onto Experienced Meaningfulness of the Work, Experienced Responsibility and Knowledge of the Results for the Programmer Group

### Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.632	.399	.374	1.20761

### Regression Table

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	SE B	Beta		
Constant	9.097	.926		9.823	.000
Experienced Meaningfulness	-.488	.145	-.395	-3.358	.001
Experienced Responsibility	-.629	.221	-.394	-3.133	.003
Knowledge of Results	.202	.171	.138	1.182	.241

Table 7.34 Regression of Affective Commitment onto Experienced Meaningfulness of the Work, Experienced Responsibility and Knowledge of the Results for the Web Developer Group

The results show that the psychological states account for 34.2 % and 37.4% of variance in the model for programmers and web developers respectively. However, in the programmer group the only variable that makes a significant contribution is that of experienced meaningfulness of work (beta=.433) which accounts for 11.6% of the unique variance. In the web developer group there is a similar contribution made between both experience meaning and experience responsibility (beta=.395 and .394 respectively) illustrating once again that experienced responsibility has a significant place in determining attitudinal outcomes for the web developer group. In particular this illustrates that web developers may need to be considered differently to programmers in terms of the level of import that is placed upon this aspect of the role within organisations. In light of this it would be incorrect to assume that the same strategies to manage performance and to encourage commitment can be established which will have the same outcomes for both groups of workers. The difference in these roles has been little attended to and it could be suggested that limited knowledge about the differentiation that exists within IT occupations may have contributed to organisations' difficulties in retaining workers in such a high demand labour market.

The final hypothesis of this study was tested to examine the relationship between the motivating potential score of the job and affective commitment using multiple regression analyses

*H33: The moderating effect of organisational identification on the relationship between motivating potential score and affective commitment will be greater for web developers than for programmers.*

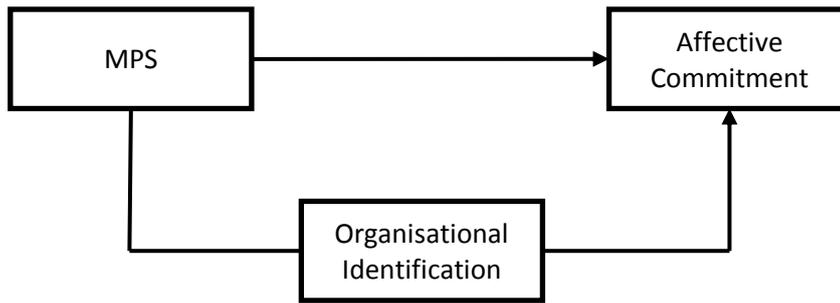


Figure 7.18 The moderation effect of organisational identification

The model was tested with a moderator variable comprising of Organisational Identification and the MPS with results shown below in tables 7.35 and 7.36.

Model Summary<sup>c</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.727 <sup>a</sup>	.529	.521	1.08658
2	.752 <sup>b</sup>	.566	.555	1.04761

a. Predictors: (Constant), Organisational Identification, MPS

b. Predictors: (Constant), Organisational Identification, MPS, Moderator MPS x Organisational Identification

c. Dependent Variable: Affective Commitment

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	SE B	Beta		
1	Constant	7.233	.298		24.302	.000
	MPS	-.005	.002	-.211	-3.195	.002
	Organisational Identification	-.684	.072	-.628	-9.497	.000
2	Constant	6.794	.318		21.356	.000
	MPS	.007	.004	.323	1.807	.073
	Organisational Identification	-.577	.077	-.529	-7.483	.000
	MPS x Org ID	-.003	.001	-.606	-3.201	.002

Table 7.35 Multiple Regression Analysis of Moderating Effect of Organisational Identification on the relationship between MPS and Affective Commitment in the Programmer Group

Model Summary<sup>c</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.766 <sup>a</sup>	.587	.575	1.00210
2	.779 <sup>b</sup>	.606	.588	.98593

a. Predictors: (Constant), Organisational Identification, MPS

b. Predictors: (Constant), Organisational Identification, MPS, Moderator MPS x Organisational Identification

c. Dependent Variable: Affective Commitment

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	SE B	Beta		
1	Constant	7.210	.371		19.453	.000
	MPS	-.006	.002	-.271	-3.340	.001
	Organisational Identification	-.668	.083	-.653	-8.053	.000
2	Constant	7.042	.377		18.702	.000
	MPS	.002	.005	.073	.351	.726
	Organisational Identification	-.635	.084	-.621	-7.595	.000
	MPS x Org ID	-.002	.001	-.379	-1.793	.077

Table 7.36 Multiple Regression Analysis of Moderating Effect of Organisational Identification on the relationship between MPS and Affective Commitment in the Web Developer Group

The results show that there is no moderation effect of organisational identification upon the relationship between the job characteristics MPS and affective commitment within the web developers ( $p = .077$ ). Whilst the moderation effect is not significant for web developers it should be noted that the model does increase from step 1 to step 2 from .575 to .588 with only organisational identification accounting for any significant variance in the model. This is difficult to explain given the results here but it is suggested that this may be related to the closeness of the organisational identification and affective commitment constructs. There is a significant report (beta =  $-.606$ ,  $p = .002$ ) for the programmer group indicating that organisational identification moderates the aforementioned relationship there is a change in the model from .521 to .555 when including the moderator. The results lead to the rejection of the hypotheses (H33) and raise the question as to why this may be the case as it is in contrast to that which was anticipated. The rationale for the hypothesis was located within the assumption that web developers would undertake work which was boundary spanning and contingent upon input from a wide range of intra and extra-organisational sources, thereby increasing the sense of organisational commitment and affective commitment as a result. It may be that the environment that programmers work in locates them, in identity and commitment terms, very firmly in the organisation in contrast to the web developer whose role frequently transcends the formal organisation. This demonstrates the difficulty in examining knowledge workers without any organisational context. New ways of organising suggest that increased boundary spanning activity and altered organisational forms such as network organisations may have an impact upon the experiences and perceptions of knowledge workers as to their work and their employing organisations. This however suggests that the effect of the ways of organising work should, to some degree, be contingent upon the nature of the work being performed

with web developers requiring greater emphasis placed, in people management terms upon the boundary spanning relationships and client related influences upon the role. (Swart et al, 2003).

### 7.5 General Discussion

The results have served to test the hypotheses relating to the refined knowledge worker archetypes of programmers and web developers. This general discussion summarises the key findings of this chapter in order to consider the development of the next phase of the research study. Tables 7.37 and 7.38 present the key findings in terms of the differences between the two archetypes.

<b>Variable</b>	<b>Programmer</b>
Skill Variety	No significance
Task Identity	Task identity of greater significance in predicting EMW than for web developers
Task Significance	No difference between archetypes
Feedback	Explains more of the variance in Knowledge of the Actual Results
Creativity	No significant moderating effect
Identification foci	<i>Team identification</i> moderated between the MPS and Internal Work Motivation <i>Organisation identification</i> moderated between MPS and Affective Commitment
Goal Orientation	Lower 'prove' Goal Orientation than web developers
Experienced Responsibility	No significance
Experience Meaningfulness of Work	Significant contribution to Affective Commitment
Autonomy	No significant difference between groups

Table 7.37 Results from Study 2 for programmer archetype

<b>Variable</b>	<b>Web Developer</b>
Skill Variety	Made greatest contribution to EMW for web developers
Task Identity	No significance
Task Significance	No difference between archetypes
Feedback	No significance
Creativity	No significant moderating effect
Identification foci	<i>Team identification</i> moderated between the MPS and job satisfaction
Goal Orientation	Higher 'prove' goal orientation than programmers
Experienced Responsibility	Significant in determining affective commitment Significant in accounting for variance in growth and job satisfaction
Experience Meaningfulness of Work	Contributed to affective commitment
Autonomy	No significant difference between groups

Table 7.38 Results from Study 2 for web developer archetype

In relation to the core job characteristics it was found that there were significant differences in the requirements of the archetypes. This was particularly evident in relation to the effect that the job had upon experienced meaningfulness of work. Skill variety was found to be of greatest significance in terms of the type of tasks engaged in for web developers in accounting for variance in experience

meaningfulness. This was not the case for the programmers where skill variety, task identity and task significance were all of relatively equal import. This could be attributed to the breadth of the work that web developers engage in, from specifying designs with customers to the development of the products (Tilley and Huang, 1999; Murugesan, 1999). It could be contrasted with the assertion in the literature that programmers are not required to be multidisciplinary in the same sense with their work tasks having a generally narrower focus (Todd et al, 1995). Task identity, as hypothesised, was not seen to be of significance in accounting for variance in experienced meaningfulness of work which may be attributed to the breadth of the role in which they engage and the scope of the work which does not allow for a 'whole' piece of work to be completed. Task significance was not tested here in relation to particular hypotheses but both archetypes results demonstrated a similar contribution of this variable to the model. Task significance was suggested to be a particular feature of knowledge work as the evidence in the exploratory study, relating to customer feedback as being motivating for knowledge workers, suggests that there is a need to see value in the work being undertaken. This variable can therefore be explored in further detail in the qualitative study.

There was found to be no difference in the results relating to autonomy between the two groups where it was anticipated that it would be of greater significance for web developers. It is suggested that autonomy may differ to such an extent across these two roles that the measures used are inadequate in determining the nature of the differences that may exist (Humphrey et al, 2007). This will therefore require further exploration within the forthcoming study. Feedback from the job was found to account for a greater amount of variance in knowledge of the results for programmers than for web developers. This also warrants further investigation as feedback may be insufficiently tested here as it may be derived from an array of sources for web developers, particularly given the suggestion that they interact with a variety of stakeholders (Pressman, 1999).

In examining the relationship between the psychological states and the outcomes within the KWCM it was found that knowledge of results was not significant in accounting for variance in internal work motivation for either group. Experienced meaningfulness accounts for the greatest amount of variance in internal work motivation for programmers in comparison with web developers. Experienced responsibility accounted for the greatest amount of variance in internal work motivation within the web developer samples. This suggests that the significance of the work which web developers undertake, in terms of its motivational properties, is related to level of autonomy in the role. Experienced responsibility was also found to account for most variance in the model in relation to growth satisfaction which was not the case for the programmer group. The importance of

experienced responsibility for web developers should be considered in further detail in the forthcoming study. With regards to general job satisfaction experienced meaningfulness of the work accounted for the greatest amount of variance in the model however, knowledge of results was also significant for the programmers. This may be a reflection of the source and type of the feedback received in this particular role. The contrast between different feedback is explored further in Chapter 8.

There were found to be no significant differences between the two groups, according to the t-tests results, with regards to foci of identification. It was anticipated that the nature of the different roles would cause web developers to identify more with their teams and organisations due to their boundary spanning activities. Programmers, given the length of time it has been established as a profession, were expected to identify more strongly with their occupation than web developers. This was not the case however and this will need to be examined in greater detail as to the nature of identification for these archetypes. However, despite this lack of difference established between the groups team identification was found to moderate between MPS and internal work motivation within the programmers group. This may be reflective of the role which the team plays in determining the nature of the tasks which are undertaken by this group.

There were no differences found between the groups in relation to the types of CPE activities engaged in. Neither was ideas generation found to act as a moderator in the KWCM for these groups. It may be that CPE should be considered only as a core job characteristic rather than as a moderating variable. There were no differences found between the groups with regards to learning goal orientation, which was expected, given that challenge and learning are seen to be dominant features of all types of knowledge work. It may be that there are differences within the creative aspects of the work of these two groups which are not adequately accounted for in this scale and which can be examined further in the interviews.

Whilst it was hypothesised that programmers would report higher levels of prove orientation due to the fact that the tasks are more defined and therefore exposed (Todd et al,1995) the t-test results demonstrated that this was not the case but that web developers reports were higher with regards to prove goal orientation. It is suggested that this may be connected to the level of exposure which these workers experience both internally and externally to the organisations in their daily interactions. Once again this identifies an unanticipated difference which should be examined further in order to understand knowledge workers and their relationships with organisations more fully.

The hypothesised higher levels of affective commitment within the web developer group were not identified as being different to the programmer group. There was also no evidence of difference in normative commitment levels between the groups. Experienced responsibility was found, in addition to experienced meaningfulness of the work, to be significant in accounting for attitudinal outcomes for the web developer group in that it contributed to the variance in affective commitment. This was not the case for the programmers, where affective commitment was only accounted for by experienced meaningfulness of work. It would seem that experienced responsibility is of significance for web developers in determining both affective commitment and internal work motivation. It could be that it is the predominance of this psychological state that encourages these workers into web development work, where there is a greater amount of scope in the work performed. This observation goes beyond the scope of this study but can be examined further in relation to motivation and attitudes to work within Chapter 8.

#### 7.6 Conclusion

The results of this study have been presented and discussed in relation to the hypotheses proposed in Chapter 6 to test the KWCM. Using t-tests and regression analyses to test the data, the results demonstrate that there are differences evident between the two archetypes (see tables 7.37 and 7.38) and that this reflects differences within the broader construct of knowledge work. The findings illustrate that, despite the broad conferment of the title knowledge worker upon these workers, there are some unique aspects to both of these archetypes which will impact upon the success of HRM practices designed to manage these workers. This is particularly important given the call, specified in Chapter 2, to manage knowledge workers differently from non-knowledge workers as it demonstrates that knowledge workers cannot be assumed to be an homogeneous group. Greater knowledge of these archetypes has been derived from the results presented here which are now used to inform the next phase of the programme of research in Study 3. Study 3 builds upon the findings detailed within this chapter and aims to deepen knowledge of the archetypes, the relationships exhibited in the KWCM and the HR practices associated with effectively managing knowledge workers.

## Chapter 8 Study 3 Results and Analysis

### 8.1 Introduction

This chapter presents the results from Study 3 which was designed to add further depth and richness through a qualitative study, as detailed in Chapter 3, to findings from Study 2 in addressing research objectives 1 and 2:

1. To examine knowledge workers attitudes to and perceptions of their work
2. To assess how knowledge workers relate to their employing organisations

This study was also designed to address the following objective through an examination of key HRM and people management themes:

3. To explore knowledge worker perceptions of people management practices and HR activities used by organisations in managing knowledge workers.

Therefore this chapter builds upon the findings from Study 2 and examines, using semi-structured interviews, the way that the archetypal knowledge workers perceive their work and their relationships with employing organisations. The interviews allow for further questioning on themes pertaining to the Knowledge Worker Characteristics Model and subjects' experiences of people management practices. This chapter focuses specifically upon themes which relate to the KWCM with analysis relating to objectives 1 and 2, with themes relating to objective 3 examined in Chapter 9. As the findings here complement and build upon Study 2 a table of combined results for the archetypes is presented in table 8.3 along with an overview of the key themes which emerge from the data (table 8.4).

### 8.2 Results

The details of the methodology for Study 3 are presented in Chapter 3 and the findings are presented in a similar format to Study 1 (Chapter 4) according to the KWCM variables and key themes. Unlike Study 1 it should be noted, as stated in Chapter 3, that all of the interviews were conducted via Skype rather than in person. As previously suggested in the methodology this may have an impact upon the data collection but rather it could be seen as generating a more relaxed interview setting than the more conventionally conducted face-to-face interviews in Study 1. A thematic analysis was conducted with similarities and differences between the archetypes identified and quotes from the subjects provided to support the analysis.

## 8.21 Sample Details

The sample was comprised of all male subjects, which was not unexpected given the low number of female respondents to the survey. The subjects were predominantly from the USA and the UK, with the web developer group also including one subject from Germany, one from Bulgaria and one from Canada. All but one of the subjects spoke English as their first language. The programmer group were predominantly from the UK with two residents of the United States. The subjects were from a variety of organisational contexts and there was little difference between the two groups in terms of the size of the organisations in which they were employed, their ages or the profile of the sector for each group, as both IT and non-IT organisations were represented in both groups. The programmer group had two subjects who were at the beginning of their career. Across both groups the majority of subjects were qualified in IT-related subjects at degree level. One physics PhD, one history graduate and one psychology graduate were included in the programmer sample. The web developer group contained two subjects with no degree who had learnt 'on the job'. Therefore the sample was considered to be appropriate in order to explore the themes which emanated from the prior studies.

ID	Location	Highest Qualification	Sector	Size of Organisation	Age	Tenure in profession
WD1	USA	College	Educational Services	1500 – 2499 employees	46	16 years
WD2	USA	College	Accommodation and Food Services	100-499 employees	30	6 years
WD3	Germany	BSc IT (Joint honours)	IT	100-499 employees	45	15 years
WD4	USA	BSc Computer Science	Professional, Scientific and technical services	20-99 employees	30	8 years
WD5	Canada	BSc Computing and Information Systems	Contractor	20-99 employees	34	13 years
WD6	USA	BSc Computer Science and maths	Contractor	100-499 employees	30	13 Years
WD7	Bulgaria	MSc Economics Maths Models	IT	1500-2499 employees	30	10 years
WD8	USA	BSc Management Information Systems	Health Care and Social Assistance	100-499 employees	28	7 years
WD9	USA	BSc Computer Science	IT	10000 + employees	34	11 years
WD10	UK	BSc Computing	IT	10-19 employees	38	17 years

Table 8.1 Web Developer Sample Details

ID	Location	Highest Qualification	Type of employment	Size of Organisation	Age	Tenure in profession
PR1	USA	BSc Computer Science	Retail Trade	10000 + employees	26	4 years
PR2	UK	PhD Physics	Utilities	2500-4999	41	10 years
PR3	UK	MSc Computer Science	IT	10000 + employees	27	3 years
PR4	UK	BA History	IT	100-499 employees	33	8 years
PR5	UK	HNC IT	Contractor	20-99 employees	41	20 years
PR6	USA	MSc Computer Science	IT	10000 + employees	23	1 year
PR7	UK	BSc Psychology	IT	10000 + employees	47	15 years
PR8	UK	BTEC	IT	2500-4999	41	20 years
PR9	UK	MSc IT	IT	20-99 employees	42	12 years

Table 8.2 Programmer Sample Details

## 8.22 Labour Market Context

In order for the researcher to fully understand the context of each of the interviews the subjects were asked to comment on their domestic labour market with regards to their occupation. Without exception each subject emphasised that there was a significant demand and limited supply of labour with respect to development work: both for web developers and programmers. This demonstrates that in North America, UK and in Europe there is little difference in labour market conditions and thus the data from the interviews can be treated similarly with regards to context. The conditions that exist give the sector a unique quality in that the demand is so high that developers are frequently approached to consider new roles. However, Cappelli (2001) raises questions as to the extent of this demand by suggesting that employers may perceive there to be more of a shortage than there is by only considering the ‘best of the best’ talent. This makes for a considerable challenge for employing organisations both in recruiting and retaining employees demonstrated as follows:

WD6 : I get a lot (of approaches) from the St Louis area but...I’ve gotten interview requests from both coasts – all over...had recruiters after me and for most senior developers that’s the case on LinkedIn. A number of people actually quit LinkedIn just because they’re getting tired of getting pestered about it so often.

Given the global economic downturn, developers are in a seemingly privileged situation which can be attributed to continuing technological developments in the industry (particularly related to mobile applications) and also to insufficient numbers of developers entering the occupation. Whilst much IT

work has, over recent years, been outsourced to cheaper global locations this has not affected domestic labour markets as markedly as might have been expected. Arguably this is because less complex work has been outsourced in the form of data centres and help-desk services, with more knowledge intensive and specialised development work retained in the domestic markets. Indeed some of the developers recounted stories about having to pick up projects which had been initially outsourced by their customers and inadequately completed. This context is important in considering the themes explored within this study and in understanding the nature of the relationship between these knowledge workers and their employing organisations, particularly when considering how organisations can best manage these workers. The interview data is therefore analysed and the data presented within this context in mind. This analysis and discussion will initially examine the core job characteristics and the outcome variables which are part of the KWCM before continuing to examine other themes which emerge from the data within Chapter 9.

### 8.23 Core Job Characteristics

Analysis of the data from Study 2 relating to the characteristics of the job and relationships from the model suggested that further exploration was required to more fully understand the ways that these knowledge worker archetypes relate to organisations and perceive their own jobs. The following analysis of the interviews explores the core job characteristics in order to build upon the prior findings. It should be noted that much of the data relating to aspects of the jobs were not generated through direct questioning relating to the facets of the model but from broad discussion around the nature of the work. However, there were direct questions asked regarding motivation and job satisfaction whereby the responses generated data which was relevant to other aspects of the model and the subjects work in more general terms.

#### 8.231 Skill variety, Task identity and Task significance

It is apparent for both groups that the nature of the work is similar in that it is fundamentally concerned with, from the subjects' perspective, solving problems and this appears to prevail in the interview data as being one of the primary motivators for both groups. The nature of these problems and the importance of level of challenge will be discussed in further detail later in the chapter. It is evident from the data that the WDs perceive that their work is highly significant (task significance "the job has a substantial impact on the lives of other people" (Hackman & Oldham, 1980; p79)) and that this is of great importance to the way that they feel about the work and the organisations in which they work. They often discuss the role of their work in helping people or its importance in

being of value for users. There was no distinction between the groups in Study 2 but it appeared evident in this study, as illustrated in the following responses:

WD4: I like knowing I made someone's life easier.... when some of our other teams tell us that what we gave them, or a change we made, has saved them three hours a day or ten hours a week or something like that it's very good to hear, I like knowing that I'm contributing that way.

WD2: it's just like working on puzzles erm which I enjoy doing...you're presented with a problem and there's no known solution so you call upon your base of knowledge to find a solution to it and then you know... you get to implement it and then the people who were having the problem aren't having the problem anymore so...it's problem solving...Intellectually you get to think about a problem and then come up with a solution and you also get help other people where they had a problem that they couldn't solve on their own and then now, because of something you did, they are able to do something better or easier, or it's helping their business or whatever... I wanted to solve a hard problem but I also wanted to be able to impact the company or at least impact the...the work of my co-workers.

WD5:...it'll take you a couple of months to build the new product or several months, but when you're done you can point to that product that didn't exist before and does exist now and know you had a hand in building it. And it's something people will use and get value out of. Ummm, you know, because making a sales brochure would be finished work too, but it probably wouldn't satisfy me as much because people would read it once and be done with it versus making something that will make their day to day lives easier.

#### 8.24 Task Identity

One of the aspects of the job characteristics which was distinct from the results in Study 2 was that of the lack of significance of task identity ("completion of a "whole" and identifiable piece of work" (Hackman & Oldham, 1980; p78)) for web developers in determining experience meaningfulness of work. It should be said that only limited data was derived from the interviews to aid in explaining this, but it could be suggested that the notion of completing a whole piece of work or a whole task is seemingly less likely given the nature of the web development work and the way in which it encompasses a number of different tasks. It could be suggested that this is as a result of the programmers' work being more easily defined, given to the programmers as discrete tasks which contrasts with the way in which web developers work.

#### 8.25 Skill variety

The web developers, according to their accounts of their work, were engaged in a wider range of activities as part of their work compared to the programmers, with opportunities to specify the solutions, liaise with customers etc. The programmers in contrast appeared to have more closely defined tasks as illustrated in this example from an IBM worker:

PR9:...you've got managers and team leaders and things who are 'this is the product feature we're going to build let's go and do it' erm but so...the thing I'm working on at the moment er I got told what the output needs to be – automating some tests

In contrast to the following explanation from web developer details the more complex nature of their work:

WD7: some software problems within big environments er well most of the people being really focused on that piece of code, gonna write it down, finish it at six and go home erm so that's kind of a job. next one, next one, producing an engineer or something whatever a part in a car factory...Some people are looking for the more relaxed environment and to have everything clarified in advance which is not really...everything being prepared for them...which isn't something for me I guess. I would like to come with the idea of how to do it not have someone else explain it to me how you're supposed to do it and actually try to resolve some problem basically – a business case that's going to help the end user in their day to day job

A general theme emerged that the web developers, on the whole, were engaged less in clearly delineated tasks. This may give an indication as to why the completion of a whole task is of little significance to this group and why skill variety explains a greater amount of variance in experienced meaningfulness of the work for this group (see table 7.38). From these findings it is apparent that there is experienced variation between the roles in terms of these core job characteristics. The analysis of this data would suggest that programmer roles are characterised by task identity, which is of interest given that the findings from Study 2 show that for programmers this was significant in generating experienced meaningfulness and this was not significant for web developers. Some of the responses relating to the scope of the role and the nature of the task also related to the notion of autonomy within the job.

#### 8.26 Autonomy

Analysis of the interview data would suggest that most of these workers report experiencing a relatively high level of autonomy in their work. However, the responses would also suggest that the type of autonomy which is reported may be different between the two groups of workers. The results from Study 2 suggest that this may be due to differences which exist within autonomy as a construct which, according to Humphrey et al (2007), could be seen as three different types of autonomy: work scheduling autonomy, work methods autonomy and decision-making autonomy. The web developers' responses suggest that they tend to have a greater degree of control over the design of the solution (as previously mentioned) but also, in many cases, the opportunity to determine the types of technologies that they are developing which is less evident in the programmers' responses. This is described by the following excerpt:

WD8: ...generally we're given higher level goals for what the product needs to do er and it's kind of up to us to figure out what a solution to that problem looks like and how we would execute that so we're not told – 'we need this new page and that's what goes on that new page' it's like 'here's this problem we need to solve what do I do'.

In contrast to this, one of the programmers, who works on internal contracts, described the amount of control he has as being very much dependent upon the circumstances but, even so, suggested that much of his work was predetermined by others:

PR7: Once you're on a contract you're expected to be an expert in what you've been assigned to ...and you're expected to know how it all works... some contracts will be very easy and very agile given that you're kind of expected to do stuff on the hoof erm there's other contracts like the military stuff will be very regimented excuse the pun (laughs)  
Interviewer: How much freedom do you have to decide when things happen or how things happen?  
PR7: How things happen - some. When things happen – none.

Another programmer (PR6) talks about the scope for independence in terms of tasks that were assigned for the week whilst another (PR2) talks in terms of the constraints related to the choice of technologies:

PR6: ... I have a lot of independence on a day to day basis about ....these are like the kind of the tasks I'll be implementing this week you know – here's a handful of things to do...er...so I've kind of then tried to then er...get erm...input from my co-workers

PR2: I do have quite a lot of autonomy... in terms of the tools we're quite constrained because we have IT provided for us by the IT services department er we can't just go off and buy something that we need because we say we need it... technically I would say I've pretty well got free rein to come up with the best solution

It would appear that there is limited scope displayed within the accounts regarding autonomy from the programmers but it is also recognises that context is a significant factor in determining the amount of autonomy experienced within an organisation:

PR5: I can do what I want – more or less. I've got more freedom to do what I want to do I suppose... In the past it depended on who you worked for...in the Post Office they told us exactly what to write and how to write it and other places you've got six months and you can decide how you want to do it.  
...It really depends upon the contract and the context.

This recognition demonstrates that congruence of the worker with the organisational context is extremely important particularly when managing expectations around levels of autonomy, independence and decision-making for developers. This is closely associated with organisational culture which is examined in greater detail as a theme of analysis within the next chapter. Given the experiences of these programmers and their organisational contexts, it could be suggested that

autonomy, in its fullest sense, is constrained by the size and nature of the organisation and therefore the amount of flexibility, or conversely, compliance that is needed to deliver the business. The extent to which autonomy and freedom is important to the individual differs in terms of the strength of feeling exhibited when questioned about autonomy:

WD6: ...yeah there's nobody looking over my shoulder there. I can basically do whatever I like so yeah I'm very happy with that that's...that's basically been true the entire time I've been at the organisation.... Yeah ...I would have a much harder time working at an organisation that didn't give me that level of autonomy or...that had a lot of rules for the way...for the way that individuals developed software. I would probably but up against that a lot and er....probably be very difficult to work with.

As previously mentioned the web developer groups also value the autonomy to make broader decisions about the nature of the work, which falls into the latter of Humphrey et al's categories of decision making autonomy. The autonomy to make decisions which also affect the technologies used is demonstrated by this excerpt as being significant in keeping the job challenging and of interest, particularly within the web developer group:

WD4: ...at least feeling like I'm being creative, because if I'm doing the same task, in the same way, day after day after day, umm, that's not very fulfilling really. And I'll admit there are times when I've completely changed errr, the platform we use, (hesitation) we pretty much use the same kind of tools, we use the xxx Platform but maybe a new project comes along er... and we'll deliberately choose a radically different platform, just so it's not drudgery. We have to learn something new; we have to apply some new principles.

To have to perform routine tasks would be seen here as being less than satisfactory and it would therefore appear that autonomy is closely associated with skill variety which was more predictive of experienced meaningfulness of work for web developers than programmers in the results within Study 2. Whilst there was no significant difference in the contribution that autonomy made in explaining experienced responsibility for either group, experienced responsibility for outcomes of the work was found to be consistently significant for web developers in explaining growth satisfaction and general job satisfaction, which was not the case for the programmers. This difference may be related therefore to the findings outlined here which suggest that web developers may experience a different form of autonomy which is not adequately captured using the JDS scales. It should be acknowledged however that there may be issues around definition of autonomy, independence and the foci of autonomy (job or person) which may not be adequately and consistently interpreted in this type of data collection method by either the interviewer or the subject. Therefore it is difficult to make clear judgements as to experiences of autonomy within these contexts for each discrete group.

It is apparent from the interview data that autonomy, in its broadest sense, is also connected to feedback, as this developer implies that too much autonomy can reduce the amount of regular feedback that is forthcoming and therefore be detrimental to their ongoing improvement. When asked whether having autonomy was important to them they replied:

WD1: I think it is...but there is too much so it would be nice to walk in closer lock-step with my supervisor in terms of, you know, solving problems. It'd be nice to kind of have a little more interplay there because you ultimately do better work and get more stuff done.

More generally, the element of feedback is evidently important for developers as there is much comment about the need for feedback in order to feel that they were aware of how well they are performing and therefore this theme will be examined in further detail.

### 8.27 Feedback

The data from the interviews is considered to be particularly pertinent in exploring the findings from Study 2 which suggests that feedback from the job explains a greater amount of variance in knowledge of the actual results of the work activities for the programmers than for the web developer group. However, the literature review pertaining to the archetypes identifies that web developers, due to the nature of the work, would be more likely to engage in boundary spanning activities and participate in dialogue with a range of stakeholders (both intra and extra-organisational) (Pressman, 2000). It would seem that there are different types of feedback which are under scrutiny here which may not have been adequately reflected in the JDS scales (which focus only upon feedback from supervisors and co-workers). Ensuring that feedback is forthcoming to developers is important in motivating them and in allowing those who have created it to understand how it is being used as detailed by WD4 and WD6:

WD4: When it comes to the team, some of them they don't need any motivation, the fact that they've built a product that works and they feel proud of it is good enough. Others are more like me, they like hearing the positive feedback, they like knowing they helped somebody, they improved someone's life.

WD6: [previous employer/supervisor] was very big on having the developers see how their software was actually used...in production...to go out...in some cases there were programs where we would actually go out and train.... I really enjoyed doing that and that was I think a good motivation to...you see it in use and you have a sense of pride when it works...you certainly get nervous when somebody is using it

This feedback from users is not only seemingly important in order to motivate but also as way of enabling developers to see how the product is being used and therefore improving it rather than

seeing the product as an abstraction. It would seem that the openness to feedback extends to circumventing other parties if necessary to enable the development process to be successful and ultimately meet the needs of the customer.

WD5: The part that I enjoy is being able to meet the needs of the customers and so what it comes down to is...if I'm not the one dealing with the customers directly how much interaction are the other people that are kind of acting on my behalf – how much are they interacting with the customers and if they're doing a bang-up job and they're able to pass those requirements off to me and I can then take them and build something that the customers need then great, everybody's happy.... the people between me and the users will take requirements but they will misunderstand them a lot or they won't get enough detail and so I've gone back to the users and said "Okay. What do you actually want? What's the problem that you're trying to solve?"

Similarly another developer identifies that feedback is crucial to make clear decisions about the design and build of the solution:

WD7: It's quite important to have the autonomy to decide but it's usually when I've got a question and I wonder what's the best thing I can do I would prefer asking the customer or a colleague I would prefer when in doubt to ask someone for a different point of view.

It is of interest to note that this web developer sees that interaction with colleagues and customers are equally welcomed and not to be seen as a threat but an opportunity for clarification and learning. In contrast, the programmers, when questioned about feedback all refer to their direct supervisors and colleagues with the following excerpts demonstrating this:

PR1: Well...I'm still with them and I've been through three rounds of redundancies that's the biggest kind of erm thing that I can say. Erm...the appreciation moves and can move over the space of two or three years. It would be nice if there's been someone following me over the eleven years and could say that had been happy with where I'd gone to or going but I don't think there is that sense because of all the managers that I've had.

PR6: so my mentor is also kind of...happens to be the one reviewing most of my code and vice versa often I'm the reviewer for his code and erm he will a lot of times when I send him my code for review will tell me you know 'this looks great' or 'really good job on this' so that's a way that I often get er...generally the positive feedback in particular – other than that er....I don't get much feedback at all which has been er...an annoying part of the job for me.

The former extract from PR1 demonstrates that inconsistent and fragmented feedback can be detrimental to the employee, particularly when this is evident over a number of years. Whilst both subjects are employed in large organisations there is a clear distinction in the approach which is taken to supervision in the two organisations. The latter is considered to be an exemplar organisation which uses pair programming to ensure that the code is being developed well and that learning is continuous. However, it would seem that this subject feels that there is still inadequate

feedback, particularly from his supervisor and at one point when asked how he knows he's doing a good job he replies that he must be 'because he is still employed there'. As programmers appear to be more frequently involved in tasks which are designed by others in the organisation this may go some way to explaining why their feedback primarily emanates from colleagues and supervisors (if indeed this does happen!). It would appear that web developers have closer contact with a variety of stakeholders, including colleagues and supervisors and therefore feedback comes from multiple sources.

Feedback is frequently referred to by both groups as being significant in experiencing a sense of satisfaction with their work as demonstrated by WD7 which he encountered when using the software himself as an end user.

WD7: That's the most rewarding part of the job when you see your actual work as end users. I've experienced that several times in my life, for example I got an insurance claim for my car from the software I had written so it was a really pleasing that piece of paper was printed from the software that I created for that company erm I booked a ticket from a site that I helped to be built so it's really interesting and when I click on it and say hmm and what is going to happen now...did I fix that issue hmm (laughs) is it going to work for me. It is a really great experience to see your work actually doing something not being thrown in a corner and having a lot of money being spent on something no-one's going to use...which does happen sometimes.

It is apparent from the interview data that feedback from supervisors and co-workers is imperative for programmers in generating job satisfaction, as is feedback from the product itself and end users/customers, particularly for web developers. This apparent difference in the loci of feedback is important to consider further in relation to knowledge workers' accounts of job satisfaction and motivation, particularly when considering the results from Study 2 which suggest that knowledge of results is of importance to both groups but whereby feedback explains a greater amount of variance for the programmer group.

#### 8.28 Motivation

The subjects were questioned as to what they felt motivated them with regards to their work and the organisations in which they worked. Their responses are predominantly connected to the challenge of the work and problem solving and are illustrated by the following excerpts:

WD2: It needs to be challenging ...I mean, challenging and impactful are the two things I like to address...if I can do some work that isn't challenging but it completely changes the way the client does things - you know turn a higher profit or whatever I enjoy that. I also like when it's a problem and I have to really spend a long time trying to figure it out and I have that nailed...so I think challenging and impactful work.

WD8: I really love getting to solve people's problems and just kind of creating something from scratch. Yeah how I can solve their problem and how I can write software that makes their lives a little bit easier.

The following web developer was similarly motivated in terms of the challenge and being able to solve new problems and it is notable that compensation was only a small part of the picture of what motivated this individual:

WD5...feeling that I've got something that is attainable, that is challenging and that is going to...that I can make happen without too many headaches getting in the way. That's really all that it takes for me to be...at least somewhat fulfilled at my job erm...being well compensated for that, having new and interesting problems to solve (subject counts all of these out on his fingers) without those first three ....if I don't have those then I'm gonna eventually start looking for something else

A similar attitude to money was evident with other workers in that it is not felt to be a primary motivator for developers (this is discussed in greater detail in terms of reward within Chapter 9). The motivation to learn and to develop, which is also linked to later findings relating to goal orientation, was demonstrated by a programmer who took a pay cut of £500 per month to move to an exemplar organisation where he saw that there were greater opportunities to learn and to develop:

PR3: we were losing money on the move erm... but I took it because I wanted to further my career – not moving up the rungs but learning more about software development and going to a place where there's a couple of thousand other people who are developers not I'm the most experienced person in the office most days erm so the education aspect was the reason I moved.

When questioned upon this issue a relatively junior programmer considered deeply what motivates him. His response was related to personal growth and the thought that he could look back in five years time and see how far he had come in his own skill development was his primary motivation. This data illustrates the extent to which the challenge of the job, problem solving opportunities, learning and improvement are significant for knowledge workers in terms of motivation. It would seem that the challenge of the work is perhaps a better way of describing motivation to work which could be seen as a bundle of the preceding components of knowledge work but which is also contingent upon the level of knowledge and expertise that the individual possesses in relation to their role. This is examined in greater detail in Chapter 10.

## 8.29 Job Satisfaction

Many of the knowledge workers, both web developers and programmers, mentioned similar facets of their work when considering what gave them a sense of job satisfaction. Put simply, one developer suggested that this was related to having 'good projects' which he qualified as being interesting and challenging:

WD10: What I would like from a company is basically to be able to get good projects to work on and then make those happen and as long as nothing's getting in the way of that then I am a happy worker.

Problems to solve and challenges were, once again, enduring themes within the interview data in relation to job satisfaction:

PR1: There are times where I feel erm...where I'm kind of faced with a certain task...and it just seems like it's going to be really difficult and then erm when I found a way to solve that problem it is satisfying erm either...either because erm it actually was difficult...where it was difficult where I did it and it worked out fine or because I maybe...found a clever way to accomplish...er to solve this problem or whatever.

In addition to a sense of achievement which is derived from solving problems there is also the feedback which comes from satisfied customers which is demonstrated by this web developer when questioned as to what makes him satisfied about his work:

WD10 Er I guess like...you know, having a lot of...having satisfied users and solving problems for people.

It would seem that these two aspects of the work are also seen by others as giving a sense of satisfaction. It should be noted that this link between customer satisfaction and job satisfaction is primarily evident within the web developer data as it is infrequently mentioned in the programmer group where team leader/manager satisfaction appears to be more relevant to the programmers. This would concur with the findings from Study 2 regarding feedback explaining a greater amount of variance in knowledge of results for the programmers than for the web developers, possibly as a result of the foci of the JDS scales. Experienced responsibility was also significant for web developers, but not for programmers in accounting for greater variance in growth and general job satisfaction which may account for their satisfaction being derived from the feedback from a wider range of stakeholders. This would also link to other findings regarding satisfaction, decision making freedom and, once more, problem solving and challenge:

WD2: I mean the reward is when you see it goes live or the impact to the customer so if...if there was some sort of huge problem and I spent months on it and it was a challenge and I was pulling my hair out half the time but when...it works and like there's no bugs and everyone loves it... like... that is the reward - that is what I look forward to.

WD8: So definitely having the autonomy – the freedom to make quite a lot of decisions erm also the technologies I get to work with...just 'cause it makes my life easier when I get to work with technologies I like - not trying to learn something new all the time although I do like learning new things – yeah that would be another one – learning new things! I do like working with new technologies as well...the challenge of it and the problem solving that goes along with it so...

The intrinsic motivation of the work itself is apparent in this web developer's account of the pleasure that emanates from the building of the product itself:

WD8: I'm not really sure but there's something about building something from scratch - there wasn't something there yesterday and there is today... writing this code and then all of sudden you have this up and running website. There's something really fulfilling about making something from nothing and having a product that you can sell to people.

This intrinsic pleasure could also be closely connected with the way which many of these workers engage in their work as a hobby activity and also with some of the allusions that are made to development work and craftwork. These connected themes will be explored further in Chapter 9.

#### 8.210 Identification

In Study 2 organisational identification was found to be significant for programmers in moderating the relationship between the job (MPS) and affective commitment, and team identification was found to moderate the relationship between the job (MPS) and internal work motivation. Identification with the team, for both groups was found to moderate between the job (MPS) and growth/general satisfaction which highlights the importance of this aspect of the organisational context for both groups. It is evident therefore that identification with the team is of import, in differing ways to the two groups of workers. Similarly, it is apparent from Study 2 that professional identification may be constructed differently in relation to team and organisational identification within the two groups. Therefore, in light of the results from Study 2, further exploration of the workers perceptions of their teams and wider organisations is undertaken in order to further understand identification and the implications for managing these groups.

#### 8.211 Professional Membership

In further exploring the theme of identification questions were asked regarding professional membership: who the subjects felt they most strongly identified with and the way in which they engaged with the broader development community. Whilst there were three subjects who had joined professional bodies because it was expected in their organisations (notably larger and

established organisations where it was a facet of the recognised mechanism for career progression and movement onto a higher pay scale), the majority of interviewees declared that they were not members of professional bodies/organisations as they did not recognise the benefits that it would bring to them personally. WD5 demonstrates this as follows:

WD5: I haven't found one (a professional association) that really brings the benefit that seems like it's worth the involvement...er both in time and money...time being the big one...a lot of it seems to be about networking with people but that's not been something that I need to be able to advance my career.

Similarly WD9 and WD4 suggest that the focus of the IEEE and the ACM (US groups) do not fit with their requirements of a professional body as there was felt to be too great a focus on academic papers, put simply '...unfortunately I didn't find it terribly engaging so at one point I just didn't renew my membership' and the feeling that:

WD4: ...they focus a lot on what's coming next, what the emerging technologies are, arguing over one platform over another and that kind of thing I'm not interested in...I just don't see a benefit to it...I can learn on my own and communities to me are a lot like those professional groups, you get the same interaction with the other members, you just don't have an organisation on top of it.

User groups, or 'meet-ups' as they are referred to in the US (or sometimes 'geek-ups' colloquially), appear to be taking on the role of professional organisations for some. These 'meet ups' provide an informal mechanism for technical discussion and social interaction with like-minded people. In Bulgaria, no professional organisation exists and therefore informal user groups take place where '...it's nothing formal, we just get together, have a beer and discuss things about development' (WD7). These groups are seen by one web developer as being more in-keeping with the spirit of software development:

WD 1: ...if I was nervous about keeping my job I would probably stack up a lot of professional affiliations to show my relevance but as a developer it's kind of like a meritocracy - I'm not going to join something just for show. The things that I join are strictly as a learning experience it's not for prestige or anything

The groups, which are often connected to specific technologies, appear to satisfy the need for collective discussion in an informed community and learning without too much formality. User group membership was more prominent within the web developer interview data which may be linked to the type of technologies used and the sense that the established professional bodies are less relevant to this type of work for historical reasons. It may also be the case that there is a greater desire for learning which extends beyond the limits of the organisations in which they work. It is

interesting to note that user group membership was viewed as an opportunity to learn rather than as a method of networking or developing contacts.

The term 'networking' appears to be negatively associated with formal business development opportunities rather than informal processes which were evident as one of the subjects talked about using his 'meet up' as a way of recommending good developers to his organisation for recruitment. In accordance with Gonzalez and Chakraborty's (2012) study the subjects seemed to consider that they were different to the type of people who join professional organisations and none of the subjects appeared to consider that the professional organisations had a particularly positive external image, at best, they were ambivalent about their usefulness. It may be that neither personal nor relational self-definitions are associated with professional membership but that relational self-definition is associated with affiliation with other developers in meet ups and user groups whereby the informality becomes a defining feature of group members identity. This should also be examined in the context of how occupational leaders are perceived by developers and how identification with them may be associated with identification with their profession/community. There was reference made to the role which these guru like figures play in the life of the development community through websites such as Stack overflow. WD9 gives an overview which is akin to many of the responses from the other subjects in explaining the type of interaction that developers have with the wider community:

WD9: I definitely read some of the development blogs there's Joel Spolsky...he's in New York City and he writes around Microsoft technologies which is something that Google doesn't really follow very much ...but I like to keep track of that. There's a guy called Scott Hanselman he has a blog and he also has Hanselminutes the podcast - again with Microsoft erm and I guess I try to follow things that I don't hear of so much from within the organisation and then there's stack overflow....and after hours I occasionally go to a Ruby development group...and Google has their own user group called Google technologies Google technologies user groups GTUG and I get to meet developers from all kinds of other companies when I do those kind of activities.

It is interesting to note that despite the importance of the wider community to this web developer he identified primarily, when questioned and within his survey response, with his team and then his organisation.

#### 8.212 Foci of identification

When subjects were asked as to who they primarily identified with there was only one reference to the organisation. This was a junior developer employed by Google who felt that the organisational culture and hygiene factors associated with it were so strong that it was the primary focus of his identification. The remaining responses identified either team or community as being of greatest

import. This is somewhat unsurprising given that team identification moderated between MPS and IWM for programmers and between MPS and job satisfaction for web developers. The following excerpts from the interview data demonstrate that there are a number of interviewees who identify with their team as their primary focus:

WD9: Pretty much in most of the jobs I've had I've identified pretty closely with the team and in the one that I'm in right now rather than with the overall organisation ... and I think Google tries to promote people to think this way - just trying to be interested in the overall industry across organisations so that you understand what are considered good practices you know...it's actually worldwide....but for me personally I identify with the team and the product that I'm working on.
WD2: I had little to no identification with my company you know... the direct team I worked with I really liked and I really identified with and we were all facing the same problem in the same organisation so we had a lot in common...I have a wide base of programmer friends – most of my friends are programmers or musicians.
WD8: Probably my team I guess or maybe the organisation....probably the team though...I read hacker news and read stuff there but...but don't really participate.

However, there are also subjects who stated that their primary identification would be with the wider development community when asked about who they would identify most strongly with:

WD7: My company is more a part of the Microsoft community in the US and Australia...so I can say I've got a lot of friends from certain user groups or going to presentations from technology or product announcements...erm I really enjoy that because we meet with people with common interests, share ideas erm... see who's faced what kind of issues and find common interests.
WD3: Where I feel my identity is?...Yeah. I would say yeah...in the broader community I mean the Agile community.
PR7: I'd say that it isn't down to specific languages - we're all pretty much the same it doesn't matter to me if someone's developed something in PHP and I've been doing it in Java I've got a lot more in common with them than I have with people in my company who don't think the same way or don't share the same aspirations ....being with people who want to code to the same standards and quality as I do I would associate with them more and I <i>know</i> those kinds of people.
WD6: I guess I'd probably say the development community. I would probably put my career....I would sort of align my career and the development community as one and the same.
WD10: Oh definitely with developers...I'm definitely there's no...they don't understand entirely what I do...there's no camaraderie, there's no...it's all in the developer community because you.... you have a common experience you know and a part of the common experience is talking about how screwed up your job is (laughs) seriously that's what developers talk about is how stupid their company is.

It was apparent from the interview data, somewhat unsurprisingly that the greater the emphasis in the discussion as to involvement with the community the greater the level of identification with the community. This was not however prompted by questioning from the interviewer. There is also evidence from this study to suggest that both community and team identification play an important

role for both web developers and programmers with no apparent distinction to be found between the groups. This is of particular interest given that evidence from Study 2 suggests that community identification has no role in moderation or in any significant relationships between variables in the model. Despite this, its importance is evident here, which is emphasised by an excerpt which illustrates the importance attributed to engaging with the wider development community by the developer's organisation:

WD9: I mentioned I'm involved in another development group and I actually run one of those and the company has provided me space and a ...and a er budget to ...supply food for that group once a month for the past eighteen months and actually it's two years now and they also give us...they'll give us time off to go to development conferences.

This recognition of the role of user groups in the ongoing development of web developers and programmers demonstrates that organisational responsibility for all aspects of occupational life is less relevant to this group. It could also be suggested that the boundaries of organisations are becoming increasingly blurred with regards to the composition of the work force, the way that developers relate to their peers and ongoing interactions with peers which take place within the working day in order to solve problems and draw from the extant community knowledge base. It is therefore appropriate to examine responses related to problem solving and creativity within the study.

### 8.213 Creativity and Problem Solving

The results from Study 2 demonstrated that there were no significant differences between the web developers and the programmers in their reported engagement with all aspects of the creative process (problem identification, information searching and ideas generation). All hypotheses were rejected including the hypothesised moderating effect of ideas generation upon the relationship between MPS and the JCM outcomes. It was suggested that in order to more fully understand creativity and problem solving within these occupations that these themes be explored in greater detail to examine what was not captured within the data within Study 2. Problem solving was prominent within the responses and felt to be synonymous with creativity:

Interviewer: Do you feel that you are a creative person?

WDM Yes.....because I am. I mean a lot of people talk about this stuff if you look at the tag line of Word Press it says underneath code is poetry – there's a lot of stuff like that which I don't completely .... I think that the creativity comes in the problem solving but you know how much of that problem solving is just being smart and how is being creative I think there's erm.....a marriage there where it's kind of a little of both ...I think the creativity comes also in solving problems that aren't related to the code. I think that a lot of creativity is just curiosity – thinking about being open to different solutions.

As within Study 1, the subjects consistently mention problem solving as a significant aspect of their work without being questioned on it and consider it to be a primary motivator and satisfier in their work.

WD10:...most important to me is being able to solve interesting problems...and not just solving them – solving them in an elegant way and in efficient ways, a way that seems to be better than I solved before.
PR2: for my own satisfaction actually I like to challenge myself...erm I like to learn new things, I like interesting problems – I like solving problems.

In analysing the responses from the transcripts there are differences in the way that the subjects articulate the concept of creativity and problem solving, with the former being more easily reconciled with web development work. It was apparent from the data that different language was used with regards to creativity in the programmer group: the notion of being ‘creative’ created greater deliberation for programmers than for the web developers. From the data gathered here this could be attributed to less creative scope in the work for programmers due to the solutions/tasks being frequently predetermined by others. This may also be connected to the type of problem solving/creativity which is taking place in line with the algorithmic/heuristic delineation of Amabile (1996). The following excerpts outline the subjects’ responses to questions about creativity:

PR3: So ‘the customer has asked for this - we must go make this thing’ – and it’s been defined by the customer and architects have met and decided what the things gonna be built like and team leaders have decided whose gonna do what and I’m just given ‘go do this thing’ which is a lot less creative.
PR 7: But I like creating stuff I enjoy doing the builds as much as I do enjoy doing.....you know the....the finding out what’s required. Finding out what’s required is the most fun I have but don’t get much of that.... Well there’ll be an architect on it typically, before I get to it they’ll have already decided what’s going to happen on it but one does a little bit...not much but I think I actually am quite creative.
PR 2: Given a framework and constraints I think I’m quite creative in coming up with solutions that meet...that...that framework
PR1: In terms of the code that we write and the creativity of how you do things there that’s kind of quite tied down in a way erm there’s an awful lot of the style that I write it in has to be dictated

The web developers reported less structure and fewer predetermined parameters in their tasks, discussing their work as being without constraints, other than those which are inherent in the problem itself. They consider the creative process and problem solving to be closely connected with a sense of achievement and intrinsic reward:

WD3: I have often unconventional approaches to things so I...I would say I'm unconventional so if that demands creativity I'm not sure erm but I certainly don't like walking along the path that's already trodden – I like trailblazing, I like...okay this is a problem no-one knows how to solve it, no-one in the world has done it before – how shall we do it? And I think that requires some kind of creativity.

WD2: You know it's...it's just like working on puzzles erm which I enjoy doing erm it's...you're presented with a problem and there's no known solution so you call upon your base of knowledge to find a solution to it and then you know...usually you do – you get to implement it and then the people who were having the problem aren't having the problem any more.

WD4:...you have to turn the basic math and the branching operations, logic operations, into something like a business process that you model and umm there's never just one way to solve a problem. And err... sometimes the best debates you have in the office are between different approaches to solve the problem and which one will prove to be more efficient in the long run.

These comments resonate with that of SDC2 from Study 1 regarding this being about 'a fight between man and the machine'. One of the developers, who is also a team lead, comments upon the need for providing creative freedom, despite the fact that this may lead to the production of a solution which is more complicated than it perhaps needs to be. It also suggests that understanding the development process and providing space to be creative is essential in allowing developers to develop their own skills.

WD4: my biggest problem is that I, when I review the work that they do, there are times when I think they've done it in a way that's more complicated than necessary, that's not as efficient as it could be. I have a hard time correcting that because we don't specify any guidelines up front, about how to approach it. I like to give them the freedom to be creative...because they might come up with a really great solution if you don't constrain them.

This excerpt also demonstrates issues inherent in coding relating to levels of complexity and the extent to which a solution should be novel or innovative. Both groups talked in detail about the way that they use and reuse code and how this is linked to adaptation of knowledge in solving problems, rather than generating completely original code. As the coders experience increases so does the bank of knowledge, experience and code which they are able to draw from and are able to reuse:

WD8: I'm not really writing a whole lot of new code it's usually just a lot of gluing together existing things to do something new using a lot existing libraries out there just patching things together to make something new. It's more about the creativity of problem solving as opposed to the creativity of writing brand new code.

WD6: in general in er...software development you're almost always just finding new uses for old solutions...very few things that people propose are actually ....are actually unique almost everything at a technical level is er.... you know has already been done... I think I am very good at finding ways to take old solutions and apply them to our existing problems and usually people have, you know, there...there are things called software patterns which essentially are best practices that people put into place when developing software and so I...I tend to eschew those and instead just do...just do my own thing and I feel that a lot of times that yields a better result.

WD1: It's good practice to reuse code but on the other hand I tend to want to write it again to make it better. You can always re-factor code, it always will be beneficial and other times I'm writing on a completely different platform. Of course you want to move forward, that's the interest.

PR5: I do a lot of putting parts together that's for sure because er I try as much as possible to keep the...erm...keep reusing third party libraries so that I'm not always building everything from scratch er....but every time you do that there's still a lot of integration work that needs to be done and that means often writing code- it's never just a drop in and forget about it there's always something that's going to impact something else that we have to build around. So there's always...always new code being written - the trick is that the kinds of codes that I'm writing are all things basically I've done before at some point - it's like: take this part over here, figure out how I interface with it, take this part over here, do the same and then build the bridge between the two.

These comments demonstrate the tension that there is in development work in reusing, refining and redeveloping code and solutions. One of the web developers identifies this tension by suggesting that there is a strong temptation to refine things and think 'I can do it better and better and keep improving it and I haven't done much of the project as I've been improving it all the time' (WD7). This iterative process and desire to learn can be problematic, which suggests that there is a fine balance to be struck in allowing developers creative freedom to exercise their expertise and being able to control the extent to which these iterations detract from the satisfactory completion of the project.

It is evident that experience generates greater resources which can then be applied to problems. However, the extent to which each of these facets of the creative process are used appears to differ depending on the developers experience, proclivity for innovation, the organisational constraints and the nature of the project. Ability to use and regenerate old solutions into new ones is of great benefit to organisations in that resources are used effectively and projects should therefore be delivered efficiently. As previously seen, there is a challenge for organisations in allowing developers sufficient space to tackle problems as they see fit but also to trust that they are skilled to do this. Experience therefore is beneficial for both parties but this can become problematic in that the problems need to remain challenging to the developers. At the beginning of a developer's career a relatively simple problem may prove to be adequately challenging whereas after several years experience a similar problem will not generate sufficient challenge to motivate and satisfy the worker. One example of this is where a developer describes a situation where the lack of challenge caused him to move jobs:

WD6: I didn't really feel very technically challenged there and I didn't think that there would be as many interesting problems to solve there as going somewhere else and ....so I felt like I would be stuck doing basically the same problems there forever so I wanted to go somewhere where I would have more variety, more ability to change projects and I'd been at my last job for two and a half years and I worked on the exact same thing.

This is also echoed by comments from both web developers and programmers, which would suggest that the complexity of the problem needs to be appropriate to the experience of the developer in order to generate sufficient challenge and consequently satisfaction with the work. One web developer mentioned that he left his previous organisation because of this frustration of work becoming maintenance focused.

WD8: I wasn't building anything with my own two hands...and I just really longed to have the creativity to build my own thing or build something at least even if it wasn't my own thing.

Whilst another developer succinctly explained 'I'm more interested in creating things than maintaining things' (WD2). It may be that the need to be continually challenged is more pertinent to web developers given that they appear, from this sample, to experience more freedom to fully scope the problems and determine solutions to these problems as part of their role. This is in keeping with the view from the archetype literature review that web developers are likely to have a greater degree of contact with a wide range of stakeholders including customers in contrast to programmers who are given work by systems analysts, architects as part of larger scale projects. Much of the data relating to problem solving and creativity is closely associated with the need to be challenged in order to continually learn. The need to learn is therefore mentioned by both groups of workers as being at the core of their work in generating relevant solutions. It would also seem that this drives many of their behaviours with regards to engaging with the wider community, as this appears to feed their general interest in new technologies and facilitates the refining of their craft around existing skills.

#### 8.214 Goal Orientation

This theme was difficult to examine fully as much of the subjects' discussion pertained to their desire to learn and develop rather than wanting to prove themselves or avoid displays of inadequate performance. Previously detailed excerpts relating to problem solving and new challenges illustrate that there is little difference between the two groups in this regard, which is congruent with the lack of distinction between learning goal orientation mean scores in the t-tests results from Study 2. The need for learning is also seemingly connected to recognition and is therefore not entirely separate from a sense of proving the developers worth. Comments such as those from PR6 illustrate the importance of challenge, growth and learning new things but also the need for having the growth recognised:

PR 6:... for my own satisfaction actually I like to challenge myself...erm I like to learn new things, I like interesting problems – I like solving problems....I like being able to er... improve.... growing and having that growth recognised

Similarly, WD6 identifies that learning new skills is extremely important but that this is within the context of the project and the constraints which exist with regards to this. This reiterates the level of freedom which is apparent in this web developer's role in that he has to balance the opportunity to learn and use unfamiliar technology with the needs of the project. He considers that he would take a risk to tackle something new and therefore does not avoid tasks that appear to be difficult.

WD6: I would take the risk even though I'm likely to fail at it however if – depending on...how important the outcome is, so if this is something for a client and we don't have a ...we don't have a lot of contingency time then I would probably choose a solution that I know well because success is important. In a lot of... in many cases we have a lot of flexibility er in terms of...in terms of our schedule so in those cases I will take as much opportunity as I can to learn new things and try to find the best solution.

The interview data demonstrates that neither web developers nor programmers perceive themselves to be the type of people that avoid tasks even if they consider them to be difficult or challenging. It could be surmised that this is related to the strong desire to be challenged in their work. Therefore, tasks which may be seen as challenging or which may be new to the developers are not considered to be threatening and to be avoided but to be opportunities for growth. The following excerpts demonstrate how important this tenacity is to the web developers' self-perception:

WD7:...I don't accept the failure of the project I wouldn't give up on that and say we just can't do it.... I will just figure out a way to do it. I will find a person to explain it to me, make it work somehow and that's...my previous manager mentioned that.....what's the word?...it was really 'enjoyed' my ability to give the sense of stability and trust that things are going to be worked the proper way and it's going to be done...even if it's not going to be done on time I will explain the situation.

WD3: I am most happy when I am struggling going uphill but succeeding erm but if everything's running really smoothly if everything's going really well then I get bored....And that's a complement because that means that I'm always taking on things that frustrate me...instead of taking on something that will just work and be really easy.

Within the results relating to seeking growth and learning new things were typically more prominent and therefore easier to identify in the analysis than those relating to prove and avoid behaviours, even when directly questioned regarding these types of goal orientation. This is unsurprising given that people are generally reticent to discuss behaviours which may be perceived as being less desirable and which are perhaps not in keeping with their own self image or the characteristics which they attribute to exemplary software development (derived from the prototypical behaviours which

inform construction of identity as detailed in Chapter 5). There is little data pertaining to the avoid goal orientation specifically as the developers answered this question with an emphasis upon challenge and an opportunity to learn. Some of the subjects directly confronted the issue of whether they wished to prove themselves in their work and the extent to which the subjects perceived themselves to have a prove goal orientation. Succinctly, PR5 suggests that 'the only person I need to prove anything to is myself' and similarly WD5 suggests that the need to 'prove' is insignificant particularly when considering that people frequently do not understand the work which he is doing:

WD5: personally...it's not...a huge deal...for...people...to know...how...how...amazing the work I'm doing is. Really what bothers me more is when people don't... basically they...they're doubting what I'm doing so... if they're...I don't necessarily mean the pat on the back...it's when people come and say "well why didn't you...why isn't this done like three weeks ago" or whatever and they're...they're basically coming up with...with unsupported assumptions about how and when things should be completed and that always kind of rankles me because they're not actually understanding the work that I do.

There are those who readily admitted that they like to prove their abilities to others as part of their identity within the development community and as people who do not shy away from problems or challenges.

WD6: I'm a pretty competitive person by nature so I enjoy like...I just sort of enjoy being the best one on my team or being the best one in a community you know for...for...whatever value of community that is I enjoy you know like knowing the most and knowing how to do stuff.... most cases I prefer to work with people better than me cause that's the best way I can learn and improve myself erm but I've kind of reached the top of the food chain within my organisation

However, for this sample of knowledge workers, analysis of the data has failed to elucidate as to whether responses genuinely relate to learning orientation or whether they can also be partially be attributed to a prove orientation. Even so, it would appear, given the results from the previous two studies, that both groups of knowledge workers have comparable learning goal orientations. It is also evident that they are similar in the way in which they perceive themselves in relation to avoid goal orientation. It is less clear as to the way that prove goal orientation differs between the two groups, particularly as this was found to be higher for web developers than programmers in Study 2 and it was found to moderate between the job MPS and internal work motivation for programmers but not for web developers. As the data derived from this qualitative study does not aid in explaining why this should be the case these issues will be discussed further in the next chapter as part of the overview of the results from the three studies.

## 8.215 Commitment

Whilst commitment and identification are acknowledged in the literature as being separate constructs many studies fail to make a distinction between the two. It is acknowledged that it can be difficult to investigate the distinctions between identification (across all foci) and affective, continuance and normative commitment to the organisation within the scope of semi-structured interviews as there is little room for deep questioning. Therefore, only questions relating to whether or not they felt committed to their organisations and what it was that elicited feelings of commitment were asked of the subjects due to the constraints of the method. Despite the narrowness of the questioning there were a number of interesting responses which are examined in greater detail, particularly with regards to commitment to their occupation. However, these responses should be considered within the context of the labour market detailed previously.

Results from Study 2 demonstrate that, for both groups of workers, experienced meaningfulness of work makes a significant contribution to explaining affective commitment. This is evident from the responses given within the interviews in this regard and supports the findings presented in relation to the job characteristics. When asked what makes the subject committed to an organisation the themes of learning and personal growth emerge from the analysis of the data but this is also accompanied by the desire to participate more broadly in the growth of organisation. WD3 illustrates this desire as does WD7:

WD3:... a feeling that I can personally grow in some way – learn something and a feeling that I can personally contribute in some way to the organisation and a feeling that the organisation is open to that and that it is achievable to ...that they will listen to suggestions

WD10 also demonstrates that this broader participation is important but that the organisational goals or values should be congruent with those of the developer. This appears also to be related to the organisational climate which is part of the distal antecedents within Meyer and Allen's (1997) multidimensional model of commitment:

WD10:...some companies are just stuck in this old thinking that okay we just throw money and...and games and parties out once a month or something like that but they don't look at the actual work environment ...so if I get a sense that there's not this eventual path that they're going towards then basically my commitment levels drop and eventually start looking for a place where I can feel like I'm committed to the job and it will end up as being a good place.

Similarly, WD7 identifies that feedback is important in determining the level of meaningful impact that the individual is making to the broader organisation and that this is significant in eliciting commitment from the developer.

WD7: Well if I see that my work is valued erm that what I do day to day is having some contribution in the actual success of the company erm...believing in what the actual goals of the company. I haven't seen many smart goals they call them for the company – we're going to achieve that number of sales and blah, blah, blah and I just don't see myself in that big picture.

These excerpts illustrate that work goes beyond transaction for these workers with the urge to be part of something bigger and more significant. These sentiments are only evident in the data from the web developers and therefore this may elucidate as to why experienced responsibility is significant in the contribution it makes to affective commitment for web developers. Whilst there is a clear sense of what makes the developers committed to their organisations there is also a sense that, because of the labour market, they could be persuaded to move organisations if the conditions were right. As previously mentioned, many of them are bombarded by opportunities to move roles but the criteria of work life balance, interesting work and a good organisation were of primary importance in determining whether they could be persuaded to move (given that the money was appropriate). PR2's response outlines this approach and WD8 identifies what it is that keeps him at his current organisation:

PR1:...if another job came up and I didn't have to move and I could keep my pension and I thought the other job looked better or more interesting I'd have no hesitation...no worries about you know other than a little bit...you know it might not last or something like that. So I don't feel a kind of a debt to the company as such that I ought to stay there.

WD8: I enjoy the people I work with; I enjoy the technology and a short commute.

Whilst the pension plan was considered important to PR1 two others in the United States mentioned that health care plans were significant reasons for staying with an employer rather than becoming completely self-employed. The high costs of healthcare have encouraged developers to stay in organisations where they were unhappy and unchallenged. One developer was unequivocal about his lack of commitment to the organisation in which he works and considers his commitment to lie firmly with the development community.

Interviewer: Are you committed to the organisation that you work for?

WD1: Not at all, not at all, none, zero, zippo.

Interviewer: Would you say that you are committed to the wider community of other developers?

WD1: Very. I mean, that's what I do.

What is perhaps most apparent in this instance is that the distinction between identification and commitment is difficult to discern without greater depth of questioning as to what this really means to the subject. This subject illustrates that this was only possible because he was doing his own 'side work' to provide the stimulus that his day job was lacking whilst providing much needed health insurance. The theme of side work and hobby development is therefore explored in greater detail in Chapter 9 due to its emergence as a strong theme which warrants further analysis.

### 8.3 Results overview

It is apparent that there are some differences exhibited between the knowledge worker archetypes of web developers and programmers in their perceptions of work and organisations as demonstrated by the results and discussion in Chapter 7. This Chapter builds on the results from Study 2 with qualitative data from Study 3 which explores the variables and related themes in greater detail. The combined detail of these findings is presented in Table 8.3. The Table shows the results for both archetypes for Study 2 and also Study 3 outlining where there is difference or commonality in the findings.

It is evident from the findings in Study 2 for web developers that skill variety was significant in contributing to their experienced meaningfulness of work (EMW). This was supported by evidence from Study 3 regarding the type and array of tasks engaged in which appear to be broader for the web developers than for programmers. The breadth that appears to be present within the web development role may also explain why the specificity of the task is of greater importance to the programmers in Study 2. Whilst task identity was seen to be of greater significance in predicting EMW for the programmers no corroborating evidence was found in the interview data relating to this variable. Study 2 demonstrated no discernible difference between the archetypes in relation to task significance but the results from Study 3 suggest that this is important to the web developer, particularly in regard to the perceived value of the product to their end-user or customer. These results demonstrate that there is an apparent difference between the groups in relation to the meaning derived from the work by web developers who are concerned with the impact of their work on a wider range of stakeholders, perhaps due to the boundary spanning nature of their role. In Study 2 feedback explained a greater amount of variance in knowledge of the actual results for programmers. These findings were supported by evidence from the data in Study 3, particularly in relation to their peers and supervisors whilst the significance of feedback from customers and end-users was seen to be important to web developers. This may be attributed to the previously described differences in the nature of the work and the array of different tasks and interactions for

each occupation. Experienced meaningfulness of work had been found to contribute significantly to affective commitment to the organisation for both groups in Study 2. The consistent reporting of the need for meaningful problems to solve in Study 3 supports this finding and suggests that job challenge is important in generating positive organisational outcomes. It is also closely associated with meaning derived from feedback from a range of sources for web developers.

The primary focus of identification was seen in Study 2 to be that of the team, whereby it moderated between the MPS and internal work motivation (programmers) and job satisfaction (web developers). Study 3 supported these findings and also demonstrated that there was a strong sense of identification with the development community in both groups. The interview data also suggested that there was little appetite to join professional associations, perhaps as a result of the strength of the community group affiliations. The findings relating to goal orientation in Study 2 were not developed further in Study 3 due to difficulties in discerning differences within the GO construct in the interview data. However, it may be that lower goal orientation for GO in programmers compared to web developers is related to the nature of the work and the relative breadth of the roles. This is particularly evident in the responses given in Study 3 relating to customer and end-user interactions for web developers and also the significance of experienced responsibility and experienced meaningfulness reported in Studies 2 and 3 for these occupational archetypes.

There were found to be no significant differences in Study 2 between the archetypes in engagement in creative processes. Study 3 findings suggested however that there was a subtle difference between the groups in the way that they applied the description of creativity to their work. The programmers appeared to be less comfortable with this than the web developers, translating it into problem solving language. Study 3 confirmed that the problem solving aspect of the work was highly significant to both groups and that this was essential in terms of their need to be challenged in their work.

Variable	Programmer	Web Developer
<b>Skill Variety</b>		
Study 2:	No significance	Made greatest contribution to EMW for web developers
Study 3:		<i>Evidence that they engage in a wider range of activities as part of their work</i>
<b>Task Identity</b>		
Study 2:	Task identity of greater significance in predicting EMW than for web developers	No significance
Study 3:		<i>No evidence Comment: Does the work regularly involve a complete task with discrete identity i.e. is it less well defined than for programmers?</i>
<b>Task Significance</b>		
Study 2:	No difference between archetypes	No difference between archetypes
Study 3:		<i>This is considered to be important particularly in terms of the value of the product to the customer/society in general.</i>
<b>Feedback</b>		
Study 2:	Explains more of the variance in Knowledge of the Actual Results	No significance
Study 3:	<i>Connection to supervisor co-worker feedback</i>	<i>Connection to customer/end user/client feedback</i>
<b>Identification foci</b>		
Study 2:	Team identification moderated between the MPS and Internal Work Motivation Organisation identification moderated between MPS and Affective Commitment	Team identification moderated between the MPS and job satisfaction
Study 3:		<i>Identification with occupational community important Primarily identify with the team rather than the organisation</i>
<b>Goal Orientation</b>		
Study 2:	Lower 'prove' Goal Orientation than web developers	Higher 'prove' goal orientation than programmers
<b>Experienced Responsibility</b>		
Study 2:	No significance	Significant in determining affective commitment Significant in accounting for variance in growth and job satisfaction
Study 3:		<i>Feedback received from a wider range of users – sense of achievement from satisfied customers</i>
<b>Creativity (CPE)</b>		
Study 2:	No difference between groups	No difference between groups
Study 3:	<i>Unsure of applying term 'creative' to their work</i>	<i>Content with applying term 'creative' to their work</i>
<b>Experience Meaningfulness of Work</b>		
Study 2:	Significant contribution to Affective Commitment	Significant contribution to Affective Commitment
Study 3:		<i>Derived from customer feedback and sense of higher purpose/values Achievement and meaning derived from problem solving</i>
<b>Autonomy</b>		

Study 2:	No significant difference between groups	No significant difference between groups
Study 3:	<i>Focus upon autonomy in relation to task</i>	<i>Focus upon autonomy in decision making</i>

Table 8.3 Results from Study 2 and Study 3 for Key Variables

These results demonstrate that there may be greater levels of investigation required in order to determine the fine grained differences which exist between these two archetypal knowledge workers, particularly in relation to autonomy, the role of team identification and also in the type and primary reference point for feedback. The nature and definition of the task also appears, in conjunction with the issue of feedback, to be significant in terms of the nature of the work undertaken (job design) and the impact that this has upon their relationships with organisations. The combined results presented here are developed further in an examination of the archetypes perceptions of HR practices and their employing organisations along with additional, identified themes relating to objectives 3 and 4 in Chapter 9.

It should also be noted that there are key themes which have been explored in this Chapter which extend beyond the key variables presented in Table 8.3. These are therefore presented in Table 8.4 and demonstrate findings relating to themes and practices which are commonly described in relation to managing knowledge workers (see Chapter 2).

Programmer	Web Developer
Job Challenge – problem solving	
Require access to ‘good’ projects where there is opportunity to learn	
Experience satisfaction when have satisfied customers/users	
Little desire for membership of professional bodies	
Very limited loyalty – would move for a new challenge	
Low levels of organisational commitment	

Table 8.4 Findings from Study 3

It is clear that the job challenge is a prominent issue for both archetypes. It would appear to be the prevailing issue which underpins all others, in that, if there is a challenge and a problem to solve the knowledge worker is happy, fulfilled and likely to remain in the job. This theme is linked to the opportunity to engage in ‘good’ projects where there is an opportunity for growth and learning. The feedback issue relating to customer satisfaction is found within Study 3 data relates to the felt

satisfaction when customers or end-users are happy with the product, a sentiment which wasn't expressed by the programmer interviewees. The web developers also appeared to feel at ease with the notion of their work being creative and were happy for it to be described in those terms. This was unlike the programmers who were less comfortable with this terminology and translated this into problem solving language. Both groups articulated their desire to be connected to their occupational group through meet ups, community gatherings and online connections but were sceptical about the need for establishing professional affiliations. They saw it as being unnecessary and somewhat akin to the bureaucratic constraints of over-organising that some of them had experienced in their employing organisations. Both archetypal knowledge workers talked of their limited loyalty to their employing organisations, considering that if the pay was appropriate they would be happy to move jobs if it meant that they had access to a new challenge. Loyalty and commitment appeared very much to be to the work that they were doing rather than the organisation providing the work. Once again this issue related strongly to the need for challenge and the organisations' ability to provide problems which stimulated this challenge.

#### 8.4 Conclusion

This chapter details results from the interviews in relation to the core job characteristics and the additional variables of the KWCM. The study was conducted, as detailed in Chapter 3, in order to increase understanding of the phenomena examined in Study 2. The study used semi-structured interviews with a sample of respondents who volunteered to be part of the study after completing the survey for Study 2. The data overwhelmingly suggests that these knowledge workers are consistently driven by their desire to engage in challenging work which is characterised by problem solving opportunities. It is also apparent that there are differences between web developers and programmers reports regarding sources of feedback, in that the former group state that feedback from customers and other stakeholders are of import in contributing to a sense of satisfaction in the work. Similarly, there is an apparent difference in the way in which autonomy is discussed between the two groups, particularly in the breadth of autonomy experienced by the web developer group in comparison to the programmer group. Autonomy and independence are discussed differently between the groups in terms of the type of activities engaged in, which tend towards greater levels of decision-making authority for the web developer group. Identification can broadly be considered, for all knowledge workers to be located within the team with some degree of affinity with the wider community expressed by the web developers.

It is apparent therefore, from this analysis, that the assumption from the early literature that knowledge workers (as software developers) are an homogeneous group who experience their work

and employing organisations similarly is a misapprehension. This is explored further in Chapter 9 in an examination of people management practices and additional themes which emerge from the analysis of Study 3 data. The forthcoming chapter identifies and discusses the themes relating to the final strand of the knowledge work literature concerning the need to manage this group of workers differently and addresses research objective 3 in greater depth.

## Chapter 9 Study 3 Data Analysis and Discussion: Emergent Themes and People Management Perspectives

### 9.1 Introduction

This chapter extends the analysis of the data from Study 3 with attention moving away from the variables within the KWCM towards issues relating to HR practices, people management activities and additional themes which emerged from the data (Table 8.4). This addresses research objective 3 and then draws together themes relating to people management and HRM relating to the literature in Chapter 2 for recommendations to be made Chapter 10. This analysis takes a higher order approach to knowledge work, exploring themes which integrate the component parts of the KWCM with broader contextual and cultural considerations. The primary themes for discussion relate to hobby development and side work, craftwork, career progression, perceptions of management, appraisals, reward and organisational culture. The final theme from the data identifies I and T shaped workers, which emerged directly from the interview data and which is presented with an overview of the relevant literature alongside the implications of this differentiation in understanding this occupational group as archetypal knowledge workers. This Chapter builds upon the findings presented at the conclusion of Chapter 8 combining Study 2 and Study 3 data in order to establish a comprehensive picture of the knowledge worker archetypes studied in this thesis. This chapter concludes with a presentation of the key themes relating to HRM (Table 9.1) and an analysis of the implications for managing knowledge workers.

### 9.2 Results

As in Chapter 8 the results are presented thematically and draw upon quotes from the subjects responses in relation to the themes. Many of the themes were evident due to the course of questioning relating to the characteristics of knowledge workers in line with the interview schedule whilst others emerged from the data through the process of analysis. The presentation of the results begins with one such theme addressing hobby development work and then perspectives relating to career development before exploring HRM and people management issues.

#### 9.2.1 Hobby development, side work and craft work

Many of the interview subjects mentioned that they engaged in development work outside of their 'day jobs'. The theme of side work and hobby development (pursuing development related activities in their spare time) was one which was detected in the analysis of the interview data and is one which could be attributed to a commitment to the occupation, or in its purest form to the pursuit of development work as an end in itself. It might even be described for some as being behaviour which

stems from a deep sense of vocation. Therefore, this theme is examined in order to further understand these knowledge worker archetypes and the way that they engage with their work away from their employing organisations.

For some, this hobby work has been a precursor to setting up their own businesses, for many it is a hobby and for others it is described as providing much needed interest (or “sustenance” WD1) when employed in organisations where the work lacked challenge. Software development is recognisable in accordance with Drucker’s (1963, 1999) descriptions of knowledge work in that there is a tangible end product which can be generated from very little capital investment other than knowledge, access to technology and time. These features enable workers to produce meaningful products away from an organisational context. This is increasingly the case when considering mobile application development which also requires very little resource or infrastructure in order to sell the products. However, the majority of workers who talk of hobby development are not engaging in this work to generate extra money but out of a desire to develop their own skills and to be challenged. The following excerpts demonstrate that hobby development allows enables skills in new technologies to be worked on so that different work can be undertaken, in these cases, to somewhat different ends:

WD6: I’ve been trying to learn things...learn different things in my free time and then...I’ve been trying to get projects at work that are... you know... that are different so as new projects open up hopefully I can move over and work on those.

WD2: I was doing some side work for the job I was at just ‘cause I wasn’t really being challenged there and I got enough side work to not need to work at my day job any more so I left.

In the case of WD2 this side work ultimately served as a mechanism for building a client base in his spare time so that he could leave his employing organisation. In the case of WD1, mentioned in Chapter 9, he used it as a way of sustaining himself whilst remaining at an organisation which provided him with health insurance but not interesting work.

WD1: If I didn’t have this business to come home to - what am I going to do, it would be horrible I couldn’t do it. The reason why I go to a day job is health insurance. I have fantasies often about going back to full time development on my own. In my day job I can go and space out all day and nobody would even know.

There are others that engage in activities to create interesting or useful products with one programmer working on a web site for his village hall and another, who works for IBM, ‘trying to write an iphone and android game’ in his spare time with a friend. Others talk less about

programming or development work as a hobby but refer to the need to keep on top of technologies that aren't necessarily being used in their daily work as discussed by WD9:

WD9: I feel like it's definitely up to me to read books, attend user groups and it's something I do have to do regularly ....most of the time I'm at work I'm developing directly for our own product so the other stuff like reading and learning I kinda do on the weekends. This is like CPD – akin to traditional knowledge worker responsibilities.

In general, both programmers and web developers reported that they were highly engaged in learning about developments relating to their occupation, specifically those relating to new technologies. This learning occurs using many of the aforementioned mechanisms such as reading technical publications, blogs, websites, user groups and meet ups. There are only two subjects in the sample who report that they actively avoid development work or programming as a hobby.

PR2: I do try to keep it separate...I mean I've got less interested in computers as a hobby the more I've done at work.

PR6: ...no I don't erm... I feel like I spend enough time doing that during the day so I...it doesn't really appeal to me as something I like to do outside.

It is interesting to note that both of these subjects also reported that they fell into programming work as a career rather than having a passion for it which may explain somewhat their lack of enthusiasm for hobby development activities.

It may be that for the majority of the sample this hobby activity is a residue of development activity which existed prior to entering the occupation, as many of the subjects identify that hobby development as teenagers was a precursor to their career choice. From the very simply put 'I was programming in high school actually' (WD9) to the more comprehensive accounts of hobby development work of WD6 and WD2:

WD6: my father bought our first families computer when I was about six and we've been playing with them ever since then and I've been doing...I've been distributing programmes since I was about sixteen er just for like...nothing spectacular just for 4TI based calculators but I gave those out...I would write programmes for those in my mathematics and physics and chemistry classes er just to do my homework or whatever and those were very popular among my classmates.

WD2:...In '94/'95 when the Internet was just coming to be in everyone's homes was around the same as I was entering high school and I was in a band so the first thing I ever did was making websites for my own band and erm different bands that I was in. So over time I got kind of good at that

This may be the case for many workers who follow a career derived from pursuit of a genuine passion, in that it is both their occupation and it also holds a personal interest. However, the significant difference in IT development work is that it is possible to conduct this work at home in personal time, due to the accessibility of the tools of the trade away from an organisational setting at very little cost, which also enables the developer to turn these hobby activities into viable businesses. Another theme which emerges from the interview data, which is associated with these conditions, is that of software development work being akin to craftwork. One web developer refers to this as a continuation of his discussion around creativity:

WD5: I absolutely see it (craftwork) as...the best word to describe it ...the things that I do on a daily basis don't really qualify as anything else. It's not a science by a long shot ...it doesn't really have the structure and discipline of being properly termed as engineering... it's more than just trade because although it has a lot of similarities with like the construction trades for example erm but there is a good deal of creativity aspects to...It's got a very important practical aspect to it – we're trying to *build* things that are *useful* in the *world*. It's not for sheer enjoyment like a fine art is and the theory behind it is not so strong that you could call it a science either – craft is the happy medium for me.  
Interviewer: Like an artisan?  
WD5: That's exactly right - it's somebody who's not just stamping out pieces – there is artistry to it in terms of understanding how to do things differently every time you do it, you're...you're...adapting these general solutions to specific problems.

Similarly, this programmer recognised similar facets of the work relating to craftsmanship.

PR3: I guess I see myself more as a craftsman than a creative so occasionally you can put nice flourishes on the ironwork or something but er in the main it's about building the thing that's going to be useful for somebody er and there's less kind of creativity and more...judgement

In this regard the researcher was reminded of one of the interviews from Study 1 which also alluded to the concept of development work as craftwork.

SDC2:...It's producing something, I'm not talented to produce a table or something like this so I produce software, computer programmes and this is what I can do I have exactly the same feeling when I have done a computer programme and it's working than if somebody else is doing a chair or producing something else with their own hands.

This likening of knowledge work to craft work is not without precedent as authors such as Sennett, (2008) make similar observations. It might be suggested that IT development work, as an archetype of knowledge work, is a new type of craftwork given the above descriptions and the way in which the workers frequently engage in their craft as hobby activities. This may also account for the way that

developers talk about their career aspirations and their view of opportunities within the organisations in which they work.

#### 9.22 Perspectives on Career Development

As with the previous theme, which had not been identified prior to this study, the extent to which options for career development are discussed within the sample suggests that it is of import in more fully understanding these workers. There is a strong distinction evident within the data regarding technical and managerial career options, with the latter considered, in the main, to be a less appealing career path. This appears to be largely due to their being a perceived lack of technical work in the managerial role. PR2, whilst currently acting as a team leader, does not find the thought of a permanent move into management particularly appealing for this reason.

PR2: I don't think I'd want to become sort of a full time manager that sort of further step where you stop doing technical work and you're purely managing other people. Erm...I enjoy the nitty gritty, the detail of... that's what appeals to me most erm...managing people is...is a lot more difficult (laughs) erm they're not as predictable, they don't always do what you've asked, you can have personality clashes. I've had that in the past erm with a particular manager erm... I just find the technical side more interesting.

WD6 also demonstrated the limited appeal of moving away from the technical aspects of the work:

WD6: I don't really have a desire to leave the er...leave the developer role and so something else. I've had opportunities to go into management ....I don't really wanna do that 'cause despite what anybody says my experience, at least at my organisation, has been that once you go into management you don't really get to do development any more and I enjoy development so...

This can prove to be problematic in organisations where there is no opportunity for progression away from technical roles as developers increasingly experience over time that the work becomes less challenging and they reach the ceiling of their pay grade. When combining these factors with irritations regarding organisational politics and bureaucracy there are suggestions made by some of the subjects that contracting or freelance work becomes the only appropriate employment option to address these issues. These are reminiscent of the findings of Barley and Kunda (2004) whereby organisational politics was an often cited reason for contracting. WD7 suggests that contracting provides:

WD7: ...A bit of independence form the company...seeking challenges, avoiding all the unnecessary politics that I wouldn't want to deal with if I'm in a big company...

These contextual factors also appear to encourage developers to work in smaller organisations where there is less constraint as to the nature of their role and the structure associated to conditions/pay. This is largely described in terms of the organisational culture which will be examined in further detail later in this chapter.

The developers from the large organisations including Google and IBM discuss the options available to them relating to a 'parallel track' which allows career progression for technical staff. One of the programmers who is at the beginning of his career in Google identified this as a point of discussion with his manager:

WD 9: So I kind of asked the same thing of my manager I'm like 'yeah so after so long am I supposed to become a manager or can I just continue doing very technical things for a very long time' and erm...their answer was 'yes, there's like this parallel track thing'. There are people who have been in the company from the start and they're still just writing code every day and erm...I think you could take on er...more of a design role too, technical design....you see them doing it for a long time but not like managing people in any capacity.

One of the web developers had experience of moving into management as a method of progressing his career and decided that it was taking him away from the aspects of the work which he enjoyed:

WD3: My role became more and more administrative and further and further away from the development erm... and I don't want to do that – I couldn't have done that. I have...I have sleepless nights thinking 'okay do I want to go the kind of career path erm and just er be a manager in bigger and bigger organisations or do I want to actually be involved in...in the work in some way?'

The lack of technical opportunities for developers other than those available in large organisations proves to be a difficult issue in terms of managing careers due to their strong desire to remain in a technical role. However, the desire to remain in a technical role rather than moving into management may also be tainted by the knowledge workers' general views of management.

### 9.23 Perspectives on Management

There are many reports of poor management within the data. The extent to which this is any different to views of management within the wider population is debatable but there is a particular issue which relates to the management of knowledge workers which is the lack of technical acumen exhibited by managers. Drucker (1963, 1999, 2002) cites this as being one of his early concerns with regards to managing knowledge workers suggesting that if their work is not understood technically they will not be able to be managed effectively. One of the subjects who has been in the occupation longest concurs with this view:

PR7: But there isn't the management that there was 10 and certainly not 20 years ago in the business. Managers think that they can manage anything... they can't...there are skills... there are management skills that are transferrable but that if you were going to manage a production line in an ice-cream factory it would help to work on the line first.

Interviewer: Okay so they're not technical?

PR7: No they're not tech....they don't have to be - a lot of them aren't. One of my best mates is a project manager and he started learning coding just to try and find out why it took people so long to do it (laughs) 'cos he couldn't understand

It is apparent from other subjects that they share similar frustrations regarding the skills of managers:

WD1: I mean the guy I work for at the moment is just not qualified in any way shape or form to supervise a web developer (laughs)...They don't understand it – bottom line. They just don't understand...they don't understand the process, they don't understand the dependencies; they don't understand the risks or the rewards...

PR5: It's pretty bad. Through the combination of full time employment and contracting I've probably worked for twenty or thirty companies and I've never ever met any decent management at all. I think the majority of the time it's because they can't keep up with any of the technical developments which is why they've left programming and become managers...they're in a management position because they can't do anything else.

WD4: It was actually our former customer service manager who was put in charge of us last and he thought one of our developers was underperforming because he didn't understand the complexity involved in the work...I had to explain to him why things weren't moving as quickly as he thought they should be.

One developer described the lengths that he went to, to try to communicate with his latest non-technical manager by using analogies relating to building a house:

WD4: The last one we had before this latest manager I pretty much related everything we did to building a house, because that was something he had gone through before. So, I found myself making all sorts of analogies along the lines of 'Ok, I know that seems like a simple change but you basically asked me to move a bathroom from one corner of the house to the other after the pipes have been blocked into the foundations so we have to chip up the foundation now'. 'Oh, ok, I can understand that'. A lot of house and car analogies.

Given the earlier allusions to craftwork it is unsurprising perhaps that these analogies were in a similar vein in order to communicate simply the complexities of the work. This web developer goes on to describe his new manager as being more enlightened in his understanding as to what development is about by tackling the issue of boredom and challenge which was so prominent in the earlier analysis.

WD4: His philosophy is that if somebody is underperforming it's because they are bored, they're unhappy so he'll try... Yeah, he'll try to find something that they're passionate about. Like the last time this happened it was someone who'd only been with us about six months, very talented but he started not producing very much. It turned out he was very passionate about quality and testing, so what he did is he gave him that entire area of the ration and QA testing and that was his area, he owned it

Seemingly, as with other types of occupation there are those who find managers to be good and bad but there is clearly an issue around the understanding of technical complexity. However, those subjects who report that they are relatively happy with their managers do not consider their lack of technical knowledge to be problematic. This appears to be due to the fact that they work in larger organisations and therefore also have a technical lead within the team who acts as an intermediary between the manager who undertakes managerial tasks and the development team. From the data it would appear that the technical lead role rarely becomes involved in the HR activities associated with line management, such as appraisals and performance management, which is the domain of the manager. As this is generally evident within the larger organisations (IBM, Google etc) it could be suggested that there is a greater need for more formalised roles and reporting structures here in contrast to the more ad hoc nature of the smaller organisations. The importance of the line manager is emphasised here demonstrating the importance of their role and how they are needed to bring the HR practices to life (Purcell et al, 2003; Purcell and Hutchinson, 2007). Many of the frustrations outlined above serve to illustrate the difficulties in managing a workforce whereby the processes are less visible and the product (as code) is only intelligible to the highly trained. This could be said to epitomise Drucker's views with regards to the management of knowledge work and this evidence would serve to suggest that within development work it is indeed the case. Whilst larger, more complex organisations, have attempted to mitigate the problems caused by this issue by having technical team leads that bridge this gap, it remains a problem for a significant proportion of developers, both web developers and programmers who are not located in big corporations. In order to adequately address issues identified earlier relating to motivation and job satisfaction this should also be examined as a mechanism for more appropriate management activities which may need to be built around trust rather than managerial processes or HR practices.

#### 9.24 HR Practices

In order to address the final research objective further analysis was undertaken on the data around the themes of HR practices and subjects were questioned directly on these themes. As might be anticipated given respondents disrespect for managers' understanding of their work, one of the most common points of contention was the perceived usefulness, or relevance of, performance appraisals. There was evidence of most of the subjects' organisations having an appraisal system in existence.

The extent to which appraisals were felt to be effective and useful varied but tended toward the perception that they had little bearing on the workers' performance. This was expressed in strong terms by WD3:

WD3: Appraisals are worthless (laughs) I hate them so much....they're...anything that tries to box a persons performance into a piece of paper is not going to work erm...it's doomed to failure from the beginning. It's an attempt to get away from subjectivity – you can't...

The subject qualified this by describing a better system which he had experienced whilst working in Sweden where they substituted the traditional performance appraisal with a 'development conversation which you can do several times a year where you talk more about goal setting, personal development and...(it has) more of coaching role'. It would appear from other subjects' comments that the rigidity of broad organisational appraisal frameworks can be problematic, particularly when they do not adequately reflect the type of work being undertaken. This was reflected in the comments of PR2 who suggested that the formality of the new appraisal system and competency framework was detrimental to good feedback, although this could be particularly reflective of a large organisation where IT is one department:

PR2: I don't think technical skills are valued in the company anywhere near as strongly as they were before...in previous years. Erm the things that seemed to be valued if I put my cynical hat on for a moment are...leadership skills...

Others discussed the problems associated with measures which were not relevant to the technical role and also with 360° systems which were commonplace.

PR7: You send out loads of bits of paper saying 'how did I perform' and loads of people send me bits of papers saying 'how did I perform' and they can be from above me and below me.  
Interviewer: Right. How does that work do you think?  
PR7: mmmmm. Generally quite badly....I think generally it's a back-slapping exercise  
Some people really do it well...*really* do it well...some people do that, some people don't, most people will just say 'no problem you did well you're doing this, this, this and this'. Any problems? 'No' (laughs)

It is not uncommon to find that appraisal systems do not achieve what they are intended to in terms of providing good feedback mechanisms and in generating motivation. However the lack of managerial technical knowledge, as previously discussed, adds an additional level of complexity to the process. This is demonstrated in WD8's comment regarding managerial contact and which also

illustrates the confusion which seems to exist for many of the subjects around how rewards are calculated:

WD8: I think we're supposed to have performance appraisals twice a year and pay review once a year...I have no idea how it works... I'm not sure they've figured that out...at my last place there were performance appraisals but it was more based around what our manager thought which was kind of tricky because our manager didn't have a lot of day to day interaction with us and what I could do to increase my pay seemed really quite arbitrary so...it was a little strange....it was a giant mystery to us.

Many of the subjects, both programmers and web developers, regard appraisals as being inconsequential in motivating them and are very unclear about how, or if, they are attached to a reward system. This suggests that monetary reward is of limited consequence to many developers in enhancing performance or in contributing to their decisions regarding their relationship with the organisation. It could be suggested that once the pay is appropriate (paid at market rate) the developer is not particularly interested in additional payments as long as there is interesting work and a good organisational culture. This is illustrated by the comments of WD1:

WD1: Compensation is never a problem....the money will come and go, it's about your experience. It's kind of like the whole purpose here we're supposed to be doing something that we love or enjoy and the enjoyment for me is coming from getting a really good project...the work I'm looking at on my screen is pro bono....mostly it's a good project, it came out well, I learnt about using wordpress as a CMS (Content Management System), I'm all about it.

Therefore, in order to examine the links between reward and motivation for knowledge workers, this subject is now explored further.

#### 9.25 Pay and Reward

As previously mentioned there is an apparent lack of understanding and a certain amount of ambiguity, and indeed ambivalence, about the link between performance and reward for all but 3 of the subjects who have clear systems which include monetary rewards and trips for high performers. The following excerpt is taken from an interview with a subject who works in an organisation which is considered an exemplar in employing IT workers.

PR6: There's an annual bonus and that amount is partially based on erm your performance...that number isn't directly shared with the employee....So anyway, these...these secret numbers are put into some secret formula that helps determine erm the size of your annual bonus as well as...the shares of company stock that you'll get erm usually each year but I guess sometimes more, sometimes less depending on the situation so the compensation is tied to performance (laughs) ...they intentionally keep it kind of fuzzy I guess.

This ambiguity did not appear to affect the developer's view of his employing organisation which he felt to be excellent due to the work environment (which will be discussed in detail later in this chapter). Another developer also recounted how the bonus scheme was 'shrouded in secrecy' with an apparently arbitrary amount given at the end of the year:

WD2: It was just at the end of the year like 'Kris you've er you've really done a lot for us this year here's 5,000 dollars' I was like 'what! I would had worked harder had you told me I was gonna get 5,000 dollars'

For many developers reward seemed consistently to be a secondary issue. When asked about what was the important in terms of rewards the following responses were given:

PR5: Having grateful customers. I like fixing things, making them work and the technical challenge as well if it's erm a problem that seems unsolvable and I can solve it then that's very rewarding...oh and the money...but that's a secondary thing

WD5: I have had stock options with some companies and one of them actually resulted in some real cash er that was... nice but it wasn't really a big motivating factor for me in terms of...of actually building stuff erm.... I'm more of the mind that I wanna be building stuff regardless of what's at the other end of it for me...

It would appear that the levels of complexity and ambiguity in the work do not help reward systems to elicit the desired behaviours from these knowledge workers. As previously discussed, the evidence from the interview data indicate that monetary reward is of little consequence once the basic level of compensation is satisfied. The following extract summarises well much of the interview data which relates to reward, problem solving, challenge and motivation of these knowledge workers:

WD3: pay them a good salary, pay them more than average in...in the area that you're in and so they don't think about their salary ever...so they don't come to work for their salary, they don't do it to try and get a raise – they are really happy with their salary so that's off the table erm...they come to work then because they like to solve problems because all developers have in common that they like to solve problems. So you give them really interesting, fun problems to solve and...and...if you do that they will *love* you, they will love their job, they will have a great time and they won't need to...to...to be motivated.

This approach presents an interesting challenge to those involved in managing knowledge workers and designing HR systems as the nature of the work appears to be the predominant concern with regards to motivating and satisfying this work force. Central HR practices may not be best placed to address these issues within the organisation and may detract from activity which is taking place at team level to make a conducive work environment by imposing incongruent practices into the team

setting. This leads to an analysis of data relating to the importance of the work environment and the organisational culture in managing these knowledge workers.

#### 9.26 Work Environment

The theme of organisational culture was not specifically raised through questioning by the interviewer but it was apparent from the data analysis that this is a prevalent theme in both web developers' and programmers' discussions of their experiences of employing organisations. Some of the issues raised as part of this analysis have been mentioned with regards to the extent to which organisational culture is of greater import to this web developer than the money:

WD5: I'd rather sacrifice a little bit on the money in terms of having a good work environment than the other way around so it's really case by case... er work environment is a very important thing to me and I would definitely turn down jobs that didn't have that in favour of those that do.

This programmer also suggests that smaller and newer organisations tended to be more relaxed with regards to the hierarchy and the structure which means that there are less politics and there is greater access to the key decision makers.

WD5: There's a certain amount of preference erm the smaller companies tend to be leaner, more focused on...getting the job done, less bureaucratic erm less worried about structure and you can kind of go into them a little quicker, get up to speed quicker and I tend to like that I think it's.....it's more focused on actually making a product than just having people around to fill chairs .....Erm I've interviewed for some of the larger companies and they never quite seemed as attractive at least in their interview process, they don't quite have the same drive I thought.

It should be noted that this subject works as a contractor and therefore views organisations slightly differently from those who are in permanent employment, in terms of being able to be selective as to which contracts to apply for (as seen in Barley and Kunda; 2004). Even so, permanent employees do have similar views to this developer who agree with his sentiments with regards to the start-up culture.

WD3: I think it was why I gravitated to small companies and to start-ups as well erm... in that I wasn't enmeshed in this political landscape and er... but it...it did effect me profoundly ... the worst thing I know in the world is when...when someone in an organisation says 'we can't do that here, it won't work'

WD7: It was a good opportunity to talk to any office in the world which was very powerful experience for...very enriching so er so that was a very pleasant part of the job until it started to go in a different direction getting more bureaucracy, additional project management levels in - people who stand between the customers and the actual people doing the job and it felt like we were getting into a big corporate environment erm which didn't feel right for me...didn't feel very comfortable me speaking with someone, who was going to speak with someone else who is going to check the requirements and all that...things got really difficult in communication...got too standardised...it didn't feel like the creative job that I was looking for.

Aside from the desire to be away from the bureaucracy and politics that are associated with larger organisations there is also a desire to experience a fundamentally different work culture which is typically and frequently associated with IT workers. This was predicted by Bell (1974) and termed the Adversary Culture to describe the new social class who were predicted to react strongly to bureaucratization. WD2 explains some of the features of this stereotypical culture:

WD2: for an IT worker you know you're looking at the Mark Zuckerbergs and the Googles ...the ideal IT job where you work ... and you work when you want to and you get to work on what you want to and twenty percent of your time you get to focus on our own projects and you ride racing scooters through these giant offices where everyone's having fun and drinking beer and throwing Nerf balls at each other (laughs). It seems like an almost childish ideal for a workplace and I would never want to work somewhere that was that loose but I think it is a lot different than how uptight a typical corporate job was.

WD2's explanation maybe a somewhat utopian view of the exemplar work places and WD6 explains what it is actually like to work in Google:

WD6: dress kind of is very lax... basically there is none... like seriously you're expected to wear clothes and that's about all they ask and erm...hours I think the expectation is you should work 40 hours a week - it's probably best if you come in...roughly between 9 and 5 because the other people you'll be interacting with will probably also be in around those hours but ...it's not terribly strict or anything. I have had a coworker who usually works like 1pm 'til 9 pm and everybody's fine with that.... There are so many smart developers in particular it means that I have access to the tons of existing source code ...where tools have already been built to solve problems that I'm working on erm...and also like er...they're trivial but they do have food all over the place which is like really convenient compared like having to go out to lunch or something so it really makes the day go a lot more smoothly

The organisational culture was also described from the perspective of a web developer working in a smaller organisation which is similar to many of the small software development houses:

WD4: open communication, open environment, you don't have to worry about what you're gonna wear today - what's the HR going to say about that er...what if I don't shave for a couple of weeks I don't have to worry about that I can wait for an hour or two so long as I let the guys know I'm alright - I'm just sleeping ...

Many of these accounts of organisational cultures are perhaps unsurprising given the stereotypes of IT workers, the organisations in which they work and their approach to work. However, this evidence serves to demonstrate that these conditions are not merely part of a characterisation of these workers but are vital components of organisational life which attract and retain these workers. In addition to the challenge of the job or problem solving opportunities the offer of a conducive organisational culture seems to be of great significance and appears to be more frequently associated in this data with either the 'exemplar' IT organisations (Silicon Valley companies, google, yahoo etc) or the small start-ups. It would appear that the web developers are more acutely aware of their own need to work in these kinds of conditions which may relate to the nature of their work whereby they tend to work with a greater range of stakeholders and with greater control over the work and technologies used. In relation to this a further theme which emerged directly from one of the interviews was that of I shaped and T shaped professionals. This theme was examined further in the interviews with the other subjects in order to provide a different method of articulating the differences that may exist between the archetype groups.

#### 9.27 Understanding I shaped and T shaped professionals

This theme was suggested by WD3 in one of the earlier interviews of Study 3 which allowed the researcher to investigate the literature relating to this theme and to question other subjects with regards to this matter. After analysing the data with regards to this it is suggested that this concept may be significant in explaining some of the differences which have been identified between web developers and programmers. In order to examine this further the initial excerpt which prompted this line of inquiry is presented and then a brief overview of the literature is presented prior to examining the data in detail.

WD3, who is highly engaged with the wider development community and in more expansive thinking about software development, particularly Agile development (Agile is a project management methodology), identified these two groups of workers after describing himself in these terms in talking about his own career development:

WD3: So, we talk about “I” shaped profiles and “T” shaped profiles...an I shaped profile is your traditional specialist – they know one area really, really well erm they’re experts in that whereas ...in Agile teams we...we usually look for T shaped people and these are the people that... they do have some deep knowledge in some area. I mean in mine technically it’s web protocols and development and things like that ... but also we have some knowledge in a wide range of areas so I have experience of...of running systems ...of IT systems, of help desks of a...a wide variety of different IT areas – testing, lots of stuff erm so I have a little bit of knowledge about a lot.

### *9.271 I/T shaped literature*

Against the backdrop of the prevailing economic conditions companies have identified that innovation and responsiveness are imperative in order to remain competitive and survive. According to Oskam (2009) this is achieved by ‘a new workforce’, balancing technical expertise and business acumen within the organisation in order to encourage innovation. These T-shaped engineers have knowledge, skills and attitudes which should equip them to fulfil multi-disciplinary roles within teams, particularly to develop entre/intraprenuerial innovation behaviours with ‘a basic knowledge of adjacent and connecting fields’ (Oskam, 2009; p5). The concept of the T-shaped professional was attributed to IDEO, a design agency (Kelley and Littman, 2005 cited in Oskam, 2009) articulated as having:

“...specialist knowledge in his own field (the vertical leg of the T), plus a broad knowledge base with elementary knowledge of adjacent technological fields or more general disciplines such as business administration (the horizontal leg of the T) enabling him or her to communicate with other disciplines”

(Oskam, 2009; p5)

The concept can also be traced back to a comment by David Guest in *The Independent* (1991) referring to people with this type of rounded profile who are comfortable dealing both with information systems and ‘modern management techniques’. There are also contemporaneous references from Marco Iansiti (1993) of Harvard acknowledging the need for technical expertise coupled with being ‘intimately acquainted with the potential systemic impact of their particular tasks’ (p139). Both of these references echo the literature relating to web developers and the context of rapidly developing information technology and associated industry in the early 1990’s. Whilst there is little empirical work to support the assertion that T-shaped workers are essential to organisations or are easily identified/recruited/developed, large organisations such as IBM have been keen to advocate the T-shaped principle. This is evidenced by the underpinning of IBM qualifications (Murphy, 2010) with a T-shaped profile with the horizontal leg incorporating ‘many systems, many disciplines and many team-oriented projects completed’ and the vertical leg showing depth in at least one system and at least one discipline.

The T-shaped profile has also been used in other academic settings to conceptualise the programme designs and progression routes through Bachelors and Masters degrees. The former provides the broad academic knowledge and skills with the latter developing the depth required for the T-shaped profession in specialisation and 'professional orientation'. Whilst this gives a general sense of the breadth and depth required for technical professionals it would appear that the concept of the T-shaped professional is more commonly used to convey the requirement for these workers to work effectively in a multidisciplinary environment which will consequently generate innovation. The Institute for the Future (2011) go beyond this suggesting that transdisciplinarity is essential for innovating organisations, which will require T-shaped individuals who 'can collaborate across other disciplines...to apply knowledge in areas of expertise other than one's own' (p11) for example by applying innovations in nanotechnology or neurology to computing. Oskam (2009) believes that these connections across disciplines, where the horizontal bars of the T shaped workers overlap, are crucial to developing innovative organisations where workers exhibit creative thinking and collaborative behaviours accompanied by attitudes of perseverance, tenacity and enthusiasm. These more recent comments relating to T-shaped workers, whilst more fervent in their quest for innovation, are comparable with the literature in which the concept originated relating to web development. The original context, as was previously mentioned, was one of heightened technological advancement in Internet computing which fused together IT and business in a previously unseen way. The notion of T shaped and I shaped workers may be a useful mechanism for further exploration of the differences between web developers and programmers and their roles within organisations. Therefore the data from Study 3 is presented in order to explore this theme in greater depth.

#### 9.28 T Shaped and I Shaped Results

The subjects were given a brief description of the differences between I shaped and T shaped workers as outlined above and were then asked as to their thoughts regarding this distinction. Much of the discussion focused upon differences between web developers and programmers and also used the distinction between front end and back end developers. These distinctions are not unexpected given the similarities which are evident in the aforementioned literature. WD8 suggests that web development involves greater breadth of experience in terms of being mindful of the end users and therefore needing to think about a broader set of implications for the work being undertaken:

WD8: I think as far as being a web developer you kind of have to have quite a bit of breadth erm just 'cause there's a lot of things you're doing, you're not just building a library that some other programmer's going to use. You're building something that actual human beings are going to touch so you kind of need to know a little bit about design and user interface and how people are going to interact with your product and how they can best use it...so there's... I guess, more of a human aspect to it as opposed to just being a programmer and just building code for other coders to use.

Another developer details the breadth of the web development role in engaging in boundary spanning activities:

WD7: I had to discuss with every different department the details of their requirements usually most of the departments are not that technically savvy so I had to guide them through in a non-techy way and give them some directions – that's not easy to achieve.

This also extends to the way that the title of web developer is felt to be unhelpful to one of the subjects

WD6: Sometimes I'll call myself a web application developer and to distinguish myself from somebody who's doing simple web pages or graphic design work because the work that I do is very heavily involved in logic and functionality and business analysis and all of that sort of stuff and so I wouldn't call myself (a web developer) for that reason... programming is a relatively small of what it is that I do.

Similarly, WD10 acknowledges, that there is a clear distinction between web developers and programmers in the way that they are perceived to deal with the tasks that they are given:

WD10: And the biggest thing I run into is when you are working with someone who fits the web developer mould you can give them something, you can give them umm, less guidance. You can say, here's what I want your final product to do, here's how I want it to be done, here's how I expect it to look and they can fill in the details. The people on the team who work more with the data, because, I mean data is black and white, it is this value or it is not, it's this type or it's not. You have to be much more detailed in what you specify.

This suggests that the issue of breadth and depth may also be about the type of person who is generally employed in those roles in that web developers may be more inclined to want to work with multiple stakeholders, with greater ambiguity and nuance whereas the programmers may be more comfortable with clarity derived from specifications generated by architects or analysts. This may also be useful in considering the issues around problem solving, creativity and algorithmic/heuristic distinctions. Using the terminology of front end and back end developers a similar set of observations were made by WD4 as to the level of complexity in the type of coding work:

WD4: Well, the front end development has very heavy visual element to it. You can't separate the presentation on the web away from the back end as well as you can with a traditional application development...And also, it's the web programming is not nearly as, err, there's not as many pitfalls... So someone who goes into the true raw systems development or C or C++, has to be someone who's much, er... much more comfortable with that level of complexity and detail whereas a web developer can be someone who is almost a cross between a designer and a programmer.

PR3 also identifies that there is a distinction between dealing with complexity in terms of the code and in terms of the multiple issues related to usability and the interactions that relate to refining this aspect of the product. In addition to that it is clear from his assertion that there is some snobbery with regards to these different roles where back-end and front-end developers are known to pejoratively stereotype one another:

PR3: There really is a bit of snobbery in the industry between the backend people who think that they're the hard core people who actually know how stuff works and the html, java script type front end things where...So, part of me thinks that making web pages is easier than writing operating system kernel things because if you're not doing floating point arithmetic and really hard maths...then putting up *some* kind of a web page is quite easy. It's the...the thing that is difficult on that side of things is ...like I was saying – the graphic design element, the UI (user interface), the...the being able to use it easily.

PR6 concurs with this view explaining that there is a sense that the two types of work are fundamentally different and require different skills which are not necessarily valued in the same way by both parties.

PR6: ...I'm not sure if this is really true but my impression is that like back end developers seem to feel like they're superior to front end developers in a lot of cases so....  
Interviewer: You're not the first person that's said that.  
PR6: Oh interesting yeah...er I do front end work and my friend does like... really I guess sort of back end work and he's like 'well you just...draw, you know, boxes on the screen and tell it to put this data here and it can't be that hard' and I'm like 'well it is really that hard but I can see why you think it's really trivial compared to what you do'

Similarly WD1 identifies 'that engineers tend to look down on web development' as he suggests they see web development as being a relatively menial task located in a small design organisation without understanding the complexities of the role which are typically related more to understanding the users needs (UI design aspects) and the client needs. He notes however that 'If you're a web developer working for tumblr or FB you're doing some serious engineering tasks to keep those servers serving'. A sense of the role being frequently derided by other programmers is demonstrated further by WD5 who states:

WD5: Sometimes I'll call myself a web application developer to distinguish myself from somebody who's doing simple web pages or graphic design work because the work that I do is very heavily involved in logic and functionality and business analysis and all of that sort of stuff.

WD9, in acknowledging the differences that there are within software development roles considers himself to be a web developer because 'it is comprised of a lot of front end work that you don't see in other software engineering it's kind of a particular specialty' which emphasises the differences between these two groups of workers.

### 9.3 Results from Study 3

Table 9.1 extends the findings presented in Table 8.4 by the addition of the data presented in this chapter (illustrated by the shaded area). It also includes the I/T differentiation which emerged from the analysis and includes characteristics from the literature. It is noted here that the analysis can begin to widen out again from a point of defined archetypes reached in this thesis. Therefore there is a danger that granulation is once again replaced by broad, overarching terms which detract from the need for fine grained analysis of work in the post-industrial context. However, it is presented here in order to emphasise some of the key issues which emerged and were present in Study 2 relating to fundamental differences between the type of work and outcomes for each of the archetypes.

Programmer	Web Developer
Job Challenge – problem solving	
Require access to 'good' projects opportunity to learn	
Experience satisfaction when have satisfied customers/users	
Little desire for membership of professional bodies	
Unsure of applying term 'creative' to their work	Content with applying term 'creative' to their work
Very limited loyalty – would move for a new challenge Low levels of organisational commitment	
High levels of commitment to their 'craft'	
Hobby Development	
Desire for a technical (not management) career	
Respect for a technically competent line manager	
Appraisals often inapplicable and ineffectual	
Disinterest in monetary rewards	
Conducive work environment –politics, relaxed, casual dress code	

I	T
Code Focus	People focus
Complex code	Complex collaboration
Precision from Task specification	Multi-disciplinary, boundary spanning role
Technical expertise	Team project collaborators
Depth	Multiple stakeholder contacts
	Breadth

Table 9.1 Key issues relating to HRM and Knowledge Workers

Perhaps the most fundamentally agreed upon requirement in satisfying knowledge workers is for organisations to provide them with challenge in their work (Horibe, 1999; Purcell et al, 2009; Purcell et al 2003, Newell et al, 2002, von Glinow, 1988; Hislop, 2009). This was found to be the case in the sample in this study who consistently reported that one of the most important features of their work is having problems to solve and to be presented with technical challenges. This was also seen as being of greater significance in determining whether the knowledge workers would remain with an organisation or seek other work. This therefore impacts upon the prevailing view that high commitment work practices are the primary solution (Horibe, 1999; Davenport, 2005; Hislop, 2009) to dealing with knowledge worker retention and high performance. Job challenge is seen as being a fundamental aspect of the bundle of high commitment practices alongside development opportunities (Lepak and Snell, 2002), team configurations and influence over work (Purcell et al, 2009; Purcell et al, 2003). It is apparent from this programme of research that the knowledge worker archetypes of web developers and programmers are motivated and satisfied as a result of an intrinsic love of the work. As identified in Table 9.1 both archetypes require job challenge and problems to solve, access to 'good' projects where they can learn, they are fundamentally committed to their 'craft' and frequently engage in 'hobby' development. In short, they love what they do. However, the data from this research would suggest that there is little evidence of satisfaction with the HR processes which aim to support this and produce organisational commitment. It should be noted however that team identification was significant for programmers in moderating between the MPS and Internal Work Motivation. It may be that for programmers who work in relatively structured organisational groups that attention is also paid to the configuration of the work team (Horwitz et al, 2003). The results from Study 1 and 2 suggest that these knowledge workers exhibit limited loyalty to the organisation and would be very happy to move jobs if pay and conditions remained tolerable in order that they had interesting work to engage in. It would appear that the knowledge workers

questioned here are primarily loyal to others in their occupation as is suggested regarding the old knowledge workers or traditional professionals (von Nordenflycht, 2010;) but they do not consider that this needs to be ratified with formal professional membership.

Appraisals are reported here as being pointless particularly where systems are imposed which do not reflect the technical nature of the work undertaken by the knowledge worker. This is of interest in that Swart and Kinnie (2004) in their survey of 769 professional knowledge workers (PKWs) found that there were positive relationships between performance appraisal and motivation and job satisfaction. There were also found to be positive commitment and job satisfaction outcomes associated with line management relationships, emphasising the importance placed upon FLM's by Purcell et al (2003) and Purcell and Hutchinson (2007). In the case of perceptions of career opportunities there were found to be positive relationships between all three outcome variables. The authors suggest that using HR policies which enhance career opportunities, appraisal and line manager relationships for PKWs would be most likely to have a positive effect on the professional knowledge worker attitudes. This may well also be the case for the occupational knowledge workers examined in the current study. However, it could be suggested given the findings in this thesis, that these practices could be most effective when used in addition to core practices which enhance job challenge (job design techniques) and which ensure an appropriate work environment or culture. Whilst the occupational archetypes examined here are included as part of the sample in Swart and Kinnie's (2004) study they are part of a broader sample of professional knowledge workers. It would be interesting to determine if there was any difference in the occupations represented in the study by using a granulated occupational sample of knowledge workers. This would allow assessment of the effect of the specific work type rather than using a broader conceptualisation of employees as PKWs who are distinguished by the high levels of non-routinised, knowledge input in order to generate an embedded knowledge product (Alvesson, 2001 cited in Swart and Kinnie, 2004).

Rewards are similarly considered to be of little interest providing that the base-line expectations (market-rate pay) are being met. The reward appears very much, as discussed in Chapter 8, to be in the challenge as identified by Swart (2007). Despite the claims that some workers may choose to engage in contract work (or 'to contract') due to higher pay, the employment contract type was controlled for in Study 2 and had no effect on the results relating to testing of the KWCM. Indeed Barley and Kunda (2004) note that issues relating to organisational politics, autonomy and job challenge were of equal import to them. Given the evidence presented here it would appear that the single most significant HR practice in retaining a knowledge worker is the design of the job. This

retention may not necessarily manifest itself in organisational commitment but rather to commitment to the work itself (Swart, et al 2005). Team is also seen as being important to both groups and should be recognised as a significant focus when considering HR practice. If a targeted approach to HR is taken for different occupations it may have an effect upon the nature of the team, particularly if it is multidisciplinary. Swart and Kinnie's (2013) identification of temporally segregated, professionally focused HR practices may be significant for these archetypes as practices are realigned with the knowledge workers over time. Primarily in this case it could be suggested that maintaining job challenge is reflected in job design, appraisal style and scope, development activity (that is connected to level of ability and increase the challenge of the work). It is however noted by Hislop (2009) that the onus for training and development should rest with the knowledge worker, rather than with the organisation (as is clearly the case in the reports relating to development in this study). It is identifiable from within the results that much of this development is initiated by the knowledge workers and operates within the context of the occupational community falling beyond the organisational boundary.

Newell et al (2002) however suggest that the discussion regarding HRM and knowledge workers goes beyond best practice or best fit and should rest at the cultural level. Indeed there is concern about aggregation of practices (Lepak and Snell, 2002) with a call for further understanding of the HR philosophies or 'logics', the big idea (Purcell et al, 2003) and the personnel concept of over-arching in-firm philosophies (Alvesson, 2004). This can be seen within the reports from the interviewees regarding the importance of the environment in which they work with the desire for a culture which has low levels of politics, good organisational values, relaxed atmosphere, flexibility and a casual dress code. If these aspects of the work environment are of such importance to the archetypes then it should be reflected in the overarching HR philosophy. It may be that HRM becomes less focused upon eliciting organisational commitment through bundles of practices but focuses upon initiating and sustaining job challenge within a conducive environment designated by distinct occupational groups. Indeed, Purcell et al (2003) suggest that HR practice may be best addressed in terms of occupational rather than organisational strategies. As noted in Chapter 2 HR policies and practices do not 'come to life' without line managers to enact them (Purcell and Hutchinson, 2007) and whilst affective commitment is not likely to be an outcome of frontline management interpretation of HR practice for this group it is nonetheless an important consideration. Line managers are the conduits for the HR philosophy and should therefore be able to build and sustain the right culture which appears to be of greater significance than delivering approved and centrally constructed practices. The results in Table 9.3 demonstrate that both groups consider that there is a need for the line

manager to be deemed to be technically competent due to the nature of the work. Whilst it was not directly reported this may link to the notion of respect and also to the knowledge workers own personal views of technical career preference over managerial careers.

Whilst similarities across both groups have been discussed it should be noted that differences in the nature of the roles would have a significant impact on HRM strategy and practice. Web developers have greater levels of interaction with and require feedback from a wider range of stakeholders than programmers. The extent to which feedback is derived from others rather than the job impacts upon the way that the knowledge worker is managed and the extent to which this can be delivered through line management interactions. Hislop (2009) identified the need to differentiate between the workers' client knowledge and technical knowledge as this impacted upon the levels of autonomy and decision-making available to the individual. Once again this emphasises the importance of job design and line management in contrast to organisationally specified HR practices. It also draws attention to the findings relating to I shaped and T shaped workers, which are most closely connected with programmers and web developers respectively. Whilst considering the significance of the individual and the work in relation to HRM in the post-industrial context it is important to note that changing organisational forms and altered relationships with clients will also affect HRM strategy and practices. It should be noted that conflicting identities relating to organisation, profession, team and client were also examined in Swart and Kinnie's study (2004) and management of these conflicting identities using appropriate HR practices was seen to be of value in complex, networked organisations. Whilst this research focuses on the worker as the unit of analysis and is outside of the organisational context the organisational influence cannot be ignored. Networked organisations are characterised by highly permeable boundaries, clients who are increasingly dominant in determining people management practice, fluid project teams and high degrees of autonomy and decision making (Swart and Kinnie, 2003; Swart et al, 2005; Kinnie and Swart, 2012). These conditions which resonate with the type of work attributed to the T shaped worker. The I shaped worker is perhaps more akin to the technical worker whose focus is primarily upon the completion of a discrete task where complex problem solving techniques can be applied. Whilst there is some degree of difference in the nature of feedback and task identification, in either case it is apparent that HR practices for these archetypal knowledge workers should primarily focus upon establishing and facilitating the existence of job challenge. It is this that will encourage knowledge workers to stay, to be motivated in their work and be satisfied as links to organisations are often tenuous. They are sustained by their occupational communities and their own drive to develop and improve. It could be suggested therefore given the results presented from Study 3 that HR strategy

may be more effectively directed towards developing excellent line managers who embody the HR 'big idea' (Purcell et al, 2003) and can understand and adapt the job challenge to the knowledge workers requirements. This would require the balance of technical and people focused skills of line managers to be adequately addressed by organisations in order to address the issues reported earlier in this chapter.

#### 9.4 Conclusion

This chapter focuses upon the themes related to people management and HRM alongside parallel issues of knowledge workers perceptions of their work and career. The chapter commences with a report of the themes which emerged from the data collected in Study 3, rather than being driven by the literature or the prior data collection. The themes of hobby development, side work and craft work illustrate the knowledge workers views that they are engaged in work which has substantial meaning to them. They also reported the existence of side work where they generated other opportunities for themselves to find challenges when their regular work fails to stimulate them. It maybe that this is residual of the fact that many of them began their careers before they entered full time employment by developing software in their bedrooms as teenagers. There were also reports that they considered their work to be akin to craft work, acting as artisans operating somewhere between the realms of science and art which was reminiscent of Sennet's *The Craftsman* working in the post-industrial context (Sennet, 2008). The theme of career development emerged from the data in Study 3 particularly in relation to the lack of desire to become a manager due to the need to leave the technical work behind and enter the world of managing people. This perspective may also account for the desire to see managers having technical skills which was also presented as a theme emerging from this data analysis. The interviewees responses to HR practices in relation to pay and reward, appraisals and the work environment (or organisational culture) were presented and then issues which emerged relating to themes of I and T shaped professionals were discussed. Discussion of the latter theme was supported by a brief review of literature in order to contextualise these findings. The results from Study 3 were then drawn together in order to see the differences and similarities which had emerged from this data. The analyses of Study 3, presented both in Chapter 8 and in this chapter, have demonstrated the depth and richness of the qualitative data and its value as an addition to the quantitative data presented in Chapter 7. The richness of the interview data brings alive the world of the archetypal knowledge workers studied in this thesis and allow for conclusion to be drawn about the nature of work (at least for this occupational archetype) in the post-industrial context. The final chapter of this thesis draws together a discussion of the key findings

of this programme of research in relation to the context, the literature reviewed, the research questions and objectives.

## Chapter 10 General Discussion

### 10.1 Introduction

The thesis has detailed the programme of research in relation to the research questions and objectives stated in Chapter 1 which were derived from the contextual literature (reviewed in Chapter 1) and the knowledge work literature (reviewed in Chapter 2). The research questions and objectives presented in Chapter 1 are reiterated here in order to provide a foundation for the forthcoming discussions of the programme of research.

Research questions:

- 1) Who are knowledge workers and what is knowledge work?
- 2) What are the key characteristics of knowledge work?
- 3) What perceptions/attitudes do knowledge workers have of/exhibit towards their work and to their employing organisations?
- 4) How do these attitudes affect the way in which they relate to organisations?
- 5) What perceptions do knowledge workers have of their employing organisations and the practices they use to manage these workers?
- 6) What aspects of HR strategy formation and practice should organisations address in order to effectively manage knowledge workers?

Objectives:

- 1) To examine knowledge workers attitudes to and perceptions of their work
- 2) To assess how knowledge workers relate to their employing organisations
- 3) To explore knowledge worker perceptions of people management practices and HR activities used by organisations in managing knowledge workers.
- 4) To make recommendations as to how organisations can most effectively develop HR strategies and people management strategies in order to effectively manage knowledge workers

The research design and underpinning research philosophy were presented in Chapter 3 alongside details of the research design, refinement of the archetype sample and the methods used to gather and analyses data in the 3 studies. The first study is an exploratory case study conducted using semi-structured interviews with software developers as occupational archetypes. This study explores the variables related to knowledge work and knowledge workers presented in Chapter 2. Key themes

were identified which resonated with the literature with the addition of those that emerged from the study. Chapter 5 details the occupational archetypes of knowledge workers and non-knowledge workers which were developed using occupational classification data from O\*NET whereby a set of knowledge worker variables were used to select occupational archetypes of software developer (knowledge worker archetype) and network/database administrators (non-knowledge worker archetype). The establishment of the non-knowledge worker archetype was primarily to offer a contrasting unit of analysis (or counterpoint) for further understanding of the knowledge worker archetype, akin to the binary oppositions established as routine workers or traditional workers in Chapter 2 (Despres and Hiltrop, 1995; Frenkel et al, 1995). Chapter 5 details these archetypes and the building of the key variables into the KWCM with related hypotheses. Detailed in Chapter 6, the occupational classification technique was reapplied using a more sophisticated cluster analysis and wider range of knowledge work variables in order to assess the stratification of the occupations. There was seen to be significant difference within the broader occupational archetype of software developer and the archetypes were therefore granulated to examine two knowledge worker occupations of programmers and web developers. These archetypes formed the revised units of analysis and therefore a literature review relating to these occupations was presented with a reformulation of the model and hypotheses in Chapter 6. Study 2 was a global, Internet survey comprising of the KWCM variables which surveyed a total of 521 subjects, the findings of which are detailed in Chapter 7. The results demonstrated that there were common threads between the two archetypes but that there were also significant differences which could impact upon the management of the occupational groups. Chapters 8 and 9 built qualitatively upon the findings in Chapter 7 by using semi-structured, Skype based interviews with 19 subjects (9 programmers and 10 web developers). This data explored the key themes in the KWCM (Chapter 8) and those relating to people management practices and additional themes which had emerged from the data (Chapter 9). The differentiation between the two archetypes comes in the design of the work specifically in relation to task identity, skill variety and feedback sources. The results demonstrated that the single largest issue in relation to both archetypes is the need for job challenge (comprising of problem solving opportunities) which is then supported by a desirable culture embodied in the work environment, colleagues, line managers and articulated values. This chapter draws together the key findings of the research programme presented in the thesis in line with the articulated objectives and locates the findings in the discussion of HRM and the post-industrial context presented in Chapters 1 and 2.

## 10.2 Knowledge workers attitudes, perceptions of their work and relationships to their employing organisations

The review of the literature in Chapter 2 demonstrates that there are numerous approaches to knowledge work and suggestions are made here as to how it differs from traditional/routine work and the different characteristics that knowledge workers may exhibit. Knowledge workers are found, within the literature, to be from a diverse range of sectors and organisations but are commonly said to be employed in knowledge intensive firms/organisations which go to make up the broader knowledge economy. In order to address the established research aims the design of the studies is premised upon the use of archetypes from within IT occupations as they are consistently deemed, within both normative commentary and empirical studies, as being typical examples of knowledge workers. It identified three types of knowledge work literature (relating to jobs, roles and worker characteristics) and identified some of the problems which had been suggested to be associated with knowledge worker management. The first study explored these general themes derived from the literature, and detailed additional themes which emanated from the exploratory study. As a result of the literature review and the results of Study 1 the Knowledge Worker Characteristics Model (which comprises of the Job Characteristics Model) was combined with additional variables of creativity, commitment, identification and commitment in order to examine attitudes and perceptions of knowledge workers in relation to the work and organisation. The composition of the model, supporting literature and the original hypotheses are detailed in Chapter 5. These were refined in Chapter 6 in relation to the cluster analysis results and the consequent granulation of the archetypes. The broad findings relating to the key variables in relation to the reconceptualised framework and hypotheses are now presented.

### 10.21 Autonomy

One of the predominant characteristics attributed to knowledge work and to the motivation of knowledge workers is that of autonomy. This was examined with reference to the extent to which this characteristic accounts for variance in experienced responsibility in the knowledge worker archetypes. It was hypothesised that autonomy would be found to be of greater import in accounting for this in the web developer group than in the programmer group due to the nature of the work as detailed in the reconceptualisation in Chapter 6. This was particularly with regards to Pressman (2000) who established the web developer as lone figure who carried much of the broader

responsibilities of the job in contrast to the traditional role of the programmer who was more integrated into a team. It should be noted that this was countered by Ginige and Murugesan (2001) who suggested that they were increasingly taking a more integrated role within organisations as the discipline became established at the beginning of the century. The findings from Study 2 identified however that there was little difference between the models for the knowledge worker groups in autonomy predicting experienced responsibility.

It was noted by Humphrey et al (2007) that the JDS measures a particular conceptualisation of autonomy and it therefore may not adequately assess the nuances which exist within the broader meaning of autonomy for these archetypes. In the knowledge work literature the term autonomy is used to encompass aspects of the job such as decision-making, independence and freedom to determine the tasks which are not all covered by the JDS, but which has been felt to be an adequate measure for this construct across numerous occupations and decades. Humphrey et al's (2007) use of three types of autonomy (work scheduling, work methods and decision-making autonomy) may reflect the increasing complexity of work over the last 40 years since Hackman and Oldham's (1975) model was developed. Whilst the autonomy measure was not altered to reflect this within the survey, so as to retain the integrity of the JCM, this matter was explored in further detail in Study 3 (Chapter 8). The results from Study 3 demonstrate that the subjects consistently expressed that they perceived their jobs to involve high levels of autonomy. Analysis of the data suggests that there were differences in the way that the two groups spoke of autonomy in relation to their work. Web developers expressed that their work involved a greater amount of decision making regarding the design of the solution and in determining the types of technologies which would be appropriate to use. Programmers' responses suggested that they generally worked on tasks which were given to them by others which they then had the freedom to prioritise and work on within specified parameters. The qualitative data would suggest therefore that there is a degree of difference in the type of autonomy experienced between the two groups which was not detected within the survey data. Whilst these differences weren't reflective of Study 2 findings relating to job satisfaction or other outcomes it may give an indication as to the differing experiences of work for different knowledge worker archetypes in the post-industrial context. Regardless of whether this difference was recognised from quantitative or qualitative data its existence is noteworthy and should be taken into account when considering the implications for managing these groups of workers. It also serves to demonstrate that the long held views as to what autonomy means need to be readjusted when considering knowledge workers but also using a broad categorisation term such as knowledge

workers should be applied with caution when considering matters of job design and desired outcomes for the organisation.

#### 10.22 Feedback

Feedback from the job was found to be significant in predicting knowledge of the results for both programmers and web developers. It had been hypothesised that feedback would account for a greater amount of variance in knowledge of the results for the programmers and this was accepted as 43% of the variance was explained by feedback for the programmers, in contrast to 27.2% for the web developer group. Whilst web developers are suggested to engage in activities which would expose them to feedback from a wide range of stakeholders (ONS 2010; Pressman, 2000) the feedback which is measured in Study 2 relates to co-workers and supervisors. It is apparent that, for the programmers, feedback from these sources is of greater consequence in explaining knowledge of the results of the job. There was greater evidence of need for feedback from a wider range of sources from the web developer group in Study 3. The data demonstrated that they were very aware of the importance of feedback from customers and end users in relation to the solution which they provided. Feedback, in this regard, was discussed as being highly motivating and responsible for deriving satisfaction from the work for both groups. It would appear that the loci of the feedback were supervisors or colleagues in the programmer group in contrast to the wider range of sources discussed by the web developers. Whilst it is unwise to make a judgement based upon frequency of mentions within qualitative data this is perhaps countered by the fact that the subjects were not directly questioned in this regard. Discussions pertaining to feedback were related to job satisfaction or motivation and therefore could be treated as being of import to the subjects. Whilst the hypothesis predicted that the programmer group would see a greater amount of variance accounted for in knowledge of the results by feedback it could be suggested that the type of feedback warrants further investigation in order to establish the extent to which it differs between the groups. It may also be the case, as suggested in Chapter 6, that as web development continues to evolve the job may become increasingly specialised and therefore loses some of the sense of web developers as being 'jacks of all trades' (WD Study 1). This may diminish their contact with such a wide range of stakeholders and thus change the way which they perceive feedback. Even so, these results identify that there is a notable difference between the two groups in the way that feedback predicts knowledge of the results and, as such, this should be attended to accordingly by those seeking to find the most effective way of motivating and retaining these workers. This may fall to line managers who will need to be equipped to understand occupational and role differences and adapt feedback mechanisms to accommodate these differences.

### 10.23 Skill variety

Whilst Todd et al (1995) found that programmers were primarily required to be highly technical rather than possessing business skills Lee et al (1995) argued that would not be the case in the future with increasing emphasis placed upon business acumen and soft skills. It is apparent from the data in Study 3 that programming work has not evolved to require a significant amount of business or management skill in order to perform the role. In contrast however the web developer role does appear to require many of these predicted skills. This would suggest that Todd et al's (1995) observations still stand as being accurate in that programmers are required to be highly technical specialists in line with the I shaped model proposed at the end of Chapter 9. It was hypothesised, given the nature of web development as a multidisciplinary role that skill variety would account for a greater amount of variance in experienced meaningfulness of work than in the programmer group. This was found to be the case with it accounting for 51% in comparison to 36% for the programmer group. This was evidenced in Study 3 in the accounts of the interactions with a wider variety of tasks which were undertaken by web developers including specification and design of the solutions, liaising with customers, and opportunities to select or influence technologies used. This supports Tilley and Huang's (1999) view that web development requires a renaissance person who '...needs to know a lot about a lot' (1999, p1). The scope of the role appears to be much greater for web developers and therefore would enable a variety of skills to be used frequently in attending to the role. This would account for the greater amount of variance explained by skill variety in the experienced meaningfulness of work.

### 10.24 Task Identity

Given the differences that have been described between the two groups in terms of the breadth and scope of the roles it is unsurprising to find that task identity is of greater importance to the programmer group than to the web developer group in predicting experienced meaningfulness of work. This was hypothesised to be the case based upon the descriptions of the roles in the literature review in Chapter 6 (Ang and Slaughter, 2001). Task identity (the extent to which a complete piece of work is identifiable) has no significance in the regression analysis for the web developer group. It could be suggested that the notion of task is somewhat irrelevant to the type of work undertaken by web developers who are involved in the design and delivery of a piece of work. As Taylor et al (2001) suggest, web development sees shorter development times, shorter product life-cycles and different audiences for the products which make the development work significantly different from traditional programming work. The 'higher level goals', as they are referred to by WD8 in Study 3, may also require the web developers to go through a number of iterations and re-specifications to deliver the

product according to the wishes of the customer, which in some cases may be a moving feast. These results would suggest that task identity is meaningful to the programmer group in that the 'whole' task may be a small proportion of a much larger piece of development work but this task component becomes the whole for the programmer due to the way that the task is framed and measured by the managers and colleagues. This aspect of the programmers' role may call into question the way which knowledge work is conceptualised in terms of how 'routine' the work may be in some instances (Hislop, 2008). The approach which is taken in distinguishing knowledge work from traditional or routine work is to create binary oppositions, which may be at the ends of continua but which nonetheless establish discrete categories. Despres and Hiltrop's (1995) model suggests that the foci of work for knowledge workers are customers, problems and issues whilst for traditional workers the foci are tasks, objectives and performance. Similarly the locus of the work is described for knowledge workers to be in groups and projects whilst for traditional workers this is around individuals. It is apparent from the results of this research study that these knowledge worker archetypes do not fall easily into these categories in terms of the specification of, and relationship to, the task and to the broader aspects of the work. This is also reflected in the EIU (1998) models of work (Chapter 2) which would place the programmers according to this study's results relating to task as closer to the routine worker end of the complexity continuum. It could be suggested that these models are useful in establishing criteria for discussing knowledge work in contrast to non-knowledge work in its broadest terms but the criteria do not necessarily allow gradations of knowledge work to be established due to the differences which exist at a more detailed level. It may be that in considering knowledge work there is a need for a continuum of knowledge work which stands aside from routine/traditional work which employs oppositions more akin to the I and T shaped profiles discussed in Chapter 9.

#### 10.25 Task significance

Task significance was not considered to be pertinent to the model in terms of anticipating any difference between the two groups as this has not been noted as being of significance in distinguishing knowledge workers from traditional workers. However, the qualitative data served to show that the workers were concerned with the impact that their work had upon end users and the extent to which it improved the lives of others. This was more noticeable in the interviews from the web developers as they discussed it without prompting as part of their answer to other questions and also when asked to consider what motivates them and makes them feel satisfied about their work. It may be that this is related to the boundary spanning role which web developers are suggested to have and the feedback which they received from a broader range of stakeholders.

## 10.26 Identification

Identification was not mentioned specifically within the knowledge work literature but was identified as being of relevance to further understanding knowledge workers primarily through the exploratory study (Chapter 4). The survey sought to examine the strength of the knowledge workers identification with team, organisation, community and occupation. It was hypothesised that web developers would identify more strongly with both their team and their organisations than would programmers given the boundary spanning nature of their role and their need to rely on multiple stakeholders to enable them to deliver projects (Pressman, 2000). It was also hypothesised that programmers would identify more strongly with their occupation than web developers. There was found to be no discernible difference between the two groups in terms of the stated hypotheses from the results of the t-tests. However, when examining the correlations between the identification foci it was apparent that there were significant relationships with both team and organisation identification and professional identification for programmers. There were no such significant correlations for the web developer group, which may suggest that these are closely linked in the programmer group. It was also found that team identification moderated between MPS and internal work motivation in the programmer group which was the converse of what was hypothesised based upon the nature of the web development role. For both groups it was found that team identification moderated between MPS of the job, growth satisfaction and general satisfaction.

It was apparent from Study 3 that the subjects were generally disconnected from professional bodies, despite their identification with their profession, with little interest expressed in membership, even by those who were members. The subjects considered that there was little perceived benefit to membership as they did not wish to network and did not use it as a source of information regarding technologies as they gained this from relevant websites and communities. Affiliation with external development communities, as identified in Study 3 data, was more prominent in the web developer group. There were many comments made regarding informal meet ups and developer user groups which appeared to be fulfilling the role that a professional body would be expected to take in more traditional occupations. Identification with these groups was closely connected to guru like figures who were prominent in bringing developers together, usually virtually, to discuss and share ideas, solutions, fixes related to the occupation and specific technologies. Hogg and Terry (2000) suggest that being related to an 'in group' whereby group prototypical features can be identified may be more salient given the embodiment of prototypical features in exemplar members who capture the characteristics of the group. It is interesting therefore that community identification was found not to be significant in any of the results for this

group in Study 2, albeit there were no relationships hypothesised. It may be that the definition of and affiliation to these communities is disparate and it is therefore difficult to reconcile these groups in order to form a single focus for identification in that a web developer could be a member of several groups. It may also be that the connections with the wider development community are seen in highly instrumental terms in that they help to resolve technical issues and perhaps some information is shared regarding the occupation but without necessarily generating a feeling of affiliation or identification. No matter how many of these extra-organisational interactions occur throughout a working day this does not appear to be generating a structured identification with or belonging to a particular in-group.

It is apparent therefore that the programmers' sense of identification with their team and organisation is connected more intimately with their professional identification, which does not appear to be the case for web developers. This may be explained by the fact that programming has been in existence as a profession for a longer period of time which may contribute to a sense of elite identity (Marks and Scholarios, 2007) which is evidenced in the findings in Study 3 about the rivalry which exists between front and back end developers. It is apparent for both of these groups that team identification is paramount in generating satisfaction for knowledge workers and this is also important in motivating programmers. As organisational identification is found to moderate between MPS and affective commitment in the programmer group the broader sense of identification is clearly important in encouraging these workers to remain with the organisation. It would seem that programmers' identification with their team, organisation and profession is consistent with an occupation which is more established and where there is greater clarity about the scope of the role. For web developers the notion that they are multidisciplinary 'jacks of all trades' who cross organisational boundaries may go some way to explaining their lack of identification with these organisations and with the profession more generally. Given these findings for both web developers and programmers attention should be paid to managing these workers in the context of the team which they identify with as this may help to retain these workers. This may involve optimising communication activities as suggested by Weisenfeld et al (1999). As many web developers report in the qualitative study, there is a need to promote and harness the CPD activities which are happening in the informal communities and value should be attributed to these within employing organisations. However, this should be approached with caution as attempting to replicate these communities could be detrimental given the findings relating to organisational culture suggesting that formality is generally viewed very negatively.

## 10.27 Creativity and Problem Solving

As identified in Chapter 2, in addition to autonomy, creativity and problem solving are the characteristics most frequently attributed to knowledge work. Given that the two archetypes were considered to engage in creative activities by virtue of the fact that they are knowledge workers it was hypothesised that there would be a degree of difference in terms of the emphasis of their work undertaken as part of their creative process engagement. Whilst creativity is a broad term it was suggested within Amabile's (1983) componential framework of creativity, to encompass algorithmic and heuristic problem solving as was also the case in Rogalski and Samucay's (1991) work on IT problem solving. It was hypothesised, given the nature of programming work, whereby tasks are generally clearly delineated and given to the programmers to work on, that they would be engaged in more problem identification and information searching activities than web developers. The data was also tested to determine whether web developers reported higher engagement in idea generation than programmers given the proposed heuristic nature of their work. The relationship between MPS and the JCM outcomes was suggested to be moderated by idea generation within the web developer group given the nature of the role. The findings from Study 2 led to the rejection of all of the aforementioned hypotheses as there were found to be no differences in the responses from the two groups.

It is apparent from the data from Study 3 that the subjects did consider themselves to be highly engaged in problem solving activities which illustrates that the need to solve problems is at the very core of their motivation to work. This can also be demonstrated in the need to experience challenge in their work as suggested by Swart (2007). The qualitative data themes of motivation and job satisfaction consistently include reports of problem solving described by the subjects as being imperative to experiencing these states. It is apparent from the findings in Study 3 that the web developers generally view themselves as being creative, with a greater amount of creative scope in the work that they do in comparison to the programmers. It may be that the notion of creative freedom is entwined with the subjects' understandings of autonomy, creative freedom and task identity and it is therefore problematic to attribute too much emphasis to so small a sample where meaning could be misattributed. Suffice it to say that it would appear that the nature of problem solving in these two groups differs due to the scope of their work but the extent to which this differs is difficult to ascertain using the data obtained. It is however clear that the opportunity to solve problems is imperative to creating work which engages and motivates both of these knowledge worker archetypes. The knowledge work literature is therefore to be believed in the assertion that creativity and problem solving is characteristic of knowledge work. The challenge for organisations is

in how to continue to supply appropriately challenging problems and creative opportunities for these workers in order to maintain their interest in and enthusiasm for the work. If this is not supplied the conditions within the labour market allow these knowledge workers to go to an organisation where there are more challenging and abundant problems to solve. These issues may be addressed by the adoption of configurational HR approaches detailed in the next section. However, more work is required in order to fully establish the precise nature of this activity, the extent to which it is algorithmic or heuristic, and the consequences of this for management of these two groups.

#### 10.28 Goal Orientation

The findings from Study 2 led to the rejection of the hypotheses which proposed that programmers would have a higher prove orientation than web developers with the converse being found to be true as the web developers were found to have a higher prove orientation than programmers. As illustrated in the literature review it is somewhat difficult to establish cause and effect in terms of personality and goal orientation behaviours. It could be suggested that prove goal orientation may be attributed to different understandings of 'others at work' within the scale as the web developers may see this as being a much broader group of people in contrast to the programmers who may consider the need to prove to their direct manager and team members. The difference in the types of interactions with others may therefore impact upon these findings. The hypotheses relating to moderation of the relationship between the MPS and the KWCM outcomes were also rejected other than in predicting internal work motivation for the programmers whereas no job satisfaction or growth satisfaction was affected by its presence. Therefore, the orientation to prove in relation to a goal was found to explain internal work motivation in the programmer group. This is an interesting finding given that the web developer group exhibits a higher prove orientation than the web developer group. It may be that this is related to the nature of the task and the reasons outlined in Chapter 6 related to proving ones competence affecting one's motivation. Whilst the qualitative study attempted to elucidate as to the findings in Study 2 it was difficult to ascertain the extent to which the challenges described were being embraced. The nature of the study did not allow for sufficient depth in the questioning in order for the differences between proving and avoiding to be adequately evaluated. At times the discussions were such that it was difficult to determine the difference between the subjects articulating the need for challenge as an intrinsic desire to learn and the need for them to prove their abilities. The consistent rhetoric from the web developers and programmers around challenge and problem solving served to demonstrate both groups primary motivation in their work. However, the nuances of these challenges and problems, if they are to be

utilised to retain and motivate workers, should be further evaluated to ensure that learning (as opposed to prove) orientations are being fostered and embedded in the organisational culture.

#### 10.29 Commitment

As was stated in the findings within Study 2 there are no significant differences to be found between the two groups in respect of web developers having higher affective and normative commitment than programmers, thus the hypothesis was rejected. This hypothesis was premised upon the notion that web developers have a broader organisational role and therefore will develop a greater emotional attachment to the organisation than would be expected of programmers. As the aforementioned results indicate that team identification moderates the relationship between MPS and growth and general satisfaction this would suggest that the focus of commitment may similarly be upon the team rather than the wider organisation. This could be explored in further detail by using a multiple foci of commitment approach which was initially rejected in Chapter 5 due to the overlapping of commitment and identification constructs. However, as the significance of team and job challenge as significant and differentiated variables are demonstrated in these findings it may be appropriate to examine this in further studies from a multiple foci perspective. When commitment was explored in Study 3 there were few subjects who expressed that they were particularly committed to the organisation in which they worked. When questioned as to what made them feel committed to an organisation they mentioned opportunities to grow and develop, congruence with their own values and those of the organisations and the organisational culture. It is difficult however to discern whether these responses are genuinely about commitment to the organisation or whether they are expressing something of their own self identity. It is not unexpected that organisational commitment is regarded as being something of a moot point for these archetypes given the conditions within the labour market. Purcell et al (2009) suggest in the performance causal chain model that creating job challenge is one of the practices which should impact upon organisational commitment. It could however be suggested that this will have limited effect as the commitment which is generated (if indeed that is what it could be termed) is primarily to the work itself. Many of the subjects in Study 3 suggested that they would stay in the organisation until they ran out of challenges or stimulating work and that if an appealing offer came along and was interesting enough they would move. The usual assumptions about retaining employees through establishing high commitment to the organisation should be reevaluated as it appears that these knowledge workers are committed to the work rather than to the organisation. Indeed taking a *targeted segregation* approach to HR practice configuration in a knowledge intensive environment Swart and Kinnie (2013) identify that practices related to generating organisational commitment are best suited to those workers who are organisationally focused rather than professionally focused in terms of the

generation and application of their knowledge. In this case, if the job elicits commitment, then temporally segregated practices related to this would have greatest impact.

However, as previously mentioned, there may be a felt commitment to the team as this was found to be a significant focus of the knowledge workers' identification and this differentiation between identification and commitment could be examined in further detail. It was found, in Study 2, that organisational identification moderated the relationship between the MPS and affective commitment for both groups and it was hypothesised that this was related to the wider, organisational focus of the web developer. This moderation of the relationship is evident in the programmer group, however this may be connected to the nature of the relationship between the programmer and the wider organisation which is considerably different to that of web developers given the difference in their typical roles. It is here that the notions of work and organising for work can be seen as integrated features of work in the post-industrial context where the organisational form and the work done have profound effects upon the worker.

### 10.3 Knowledge Workers and People Management Practices

In order to address the third and fourth objectives of the research programme, to evaluate knowledge workers perceptions of people management practices and make recommendations, themes were drawn from the third study and analysed accordingly. Many of the themes were derived from the knowledge work literature whilst some were discerned from the data which was analysed. Many of the extant knowledge work studies were driven by Drucker's proposal that these workers are fundamentally different in the way in which they relate to organisations and as a result should be managed differently. As previously mentioned, many texts and studies have followed in the wake of this assertion in proposing different strategies and practices in order to achieve this. This current study is able to contribute to the existing body of knowledge by presenting the differences which should be attended to in managing these occupational archetypes as members of knowledge worker population.

Early empirical work, which examines motivation and knowledge work, concludes that reward, personal growth, operational autonomy and task achievement are motivators for these workers (Tampoe, 1993). Newell et al (2002) suggest that the primary foci for HR activities with regards to these workers should be organisational culture, reward systems and careers. In line with these prior studies and in order to fully establish the extent to which HR practices and people management

activities are perceived by this group of workers the themes of job challenge, reward, performance management, managers and organisational culture will now be discussed further in relation to the knowledge worker archetypes.

#### 10.31 Job Challenge and Problems to Solve

The prevailing theme from the qualitative data in Study 3 was that these knowledge workers derived their job satisfaction and sense of achievement from engagement in problem solving and the challenge of the job. It is however apparent that the notion of job challenge goes somewhat beyond that which is captured in the core job characteristics of the KWCM as it describes a particular state whereby the nature of the task or problem appropriately fits the employees level of knowledge and experience. Purcell et al (2003) examine a range of HR practices in their research and the findings suggest that both autonomy and job challenge are significant in predicting commitment. Findings from the accompanying qualitative study also illustrate that low levels of career satisfaction are connected with low levels of job challenge (Purcell et al, 2009). As stated by Swart et al (2005) knowledge workers may not be committed to the organisation so much as to the work itself. It was considered by the researcher that this was evident in the findings from Study 3 which demonstrate that inadequate job challenge will affect the employees' desire to stay with the organisation. Given the differences that have been identified between these two groups of knowledge workers it is suggested that the nature of the task and the scope of task differs somewhat, with programmers being given more closely defined tasks. As task identity is not significant in motivating web developers it is suggested that attention is paid to not constraining them in terms of highly defined pieces of work as they appear to derive challenge from the broader problems and challenges within their work rather than highly specified tasks. As Tampoe (1993) notes, personal growth is a motivator for knowledge workers and personal growth is very much contingent upon the nature of the tasks (whatever shape or form they may take) available to these workers. Given the findings in this programme of research it is suggested that the view that all knowledge workers are motivated by challenge and problem solving is unhelpful as it is specifically the nature and specification of these challenges that needs to be examined and managed carefully in order to motivate and satisfy these two occupational archetypes. The consequences of failing to address the issue of challenge was identified previously in that many of these knowledge workers stated that they would walk away from work that did not provide them with this. The provision of interesting work for either of these archetypes cannot be derived from simplistic systems of job design as it is the interaction of the individual with the work that produces the challenge. It is suggested that this can only be managed adequately by good supervision whereby the nature of the task and the skills of the individual are

intimately known, appreciated and made congruent with one another. Figure 10.1 suggests, from these findings, a model by which job challenge could be viewed in relation to experience in order to maximise individual motivation, satisfaction and performance.

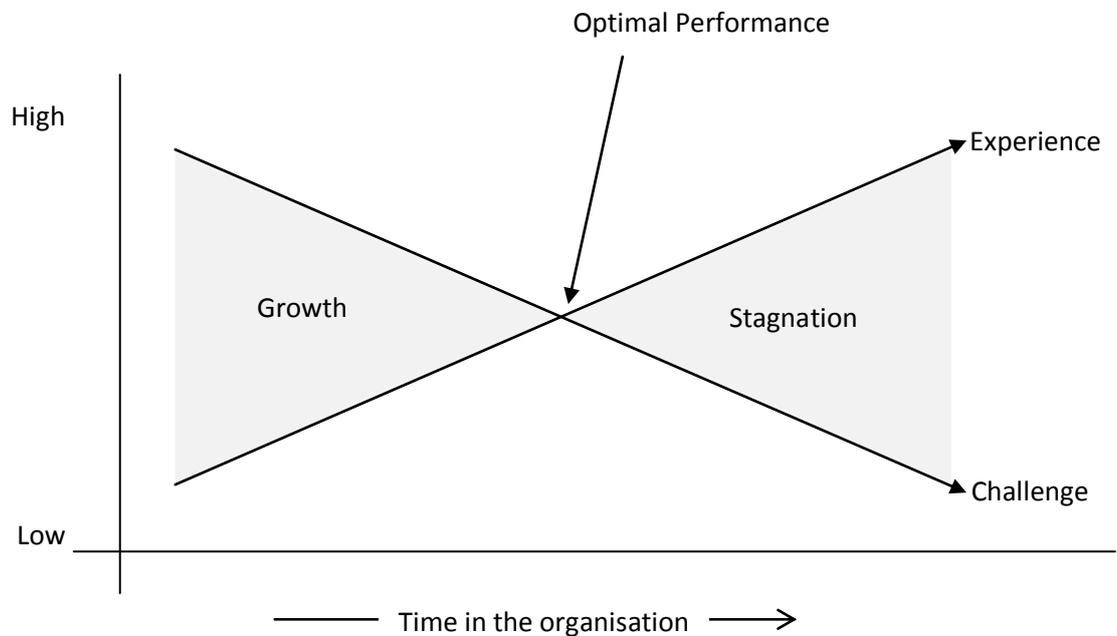


Figure 10.1 Maximising job challenge

This model proposes, in response to findings in Study 3, that over time the workers' experience (skills and knowledge) increases and develops. Over this period of time the perceived level of challenge in the tasks diminishes due to the increase in the experience and what was once creative problem solving becomes maintenance. The management imperative therefore is to ensure that the problem or challenge matches the experience level and, given the evidence from the subjects in Study 3, it is suggested it is at this intersect that optimal performance, motivation and satisfaction will occur. Knowledge of these two factors should also allow the manager to present the appropriate level of problem in accordance with the workers' experience in order to generate the desired outcomes. Indeed this may be managed by the worker themselves in the case of the web developers or it may be most appropriately devolved to the team lead for programmers. If there is insufficient challenge the data in Study 3 would suggest that, given the nature of the labour market, these knowledge workers will move to where they can find an appropriate challenge and continue to learn and develop. Knowledge of these factors should also allow the organisation to recognise the level of challenge that exists latently within a job and recruit accordingly rather than acting to replace the

skills of the individual who has left the organisation which may no longer be required. This is of course dependent upon the nature of the organisation and the type of work undertaken in it.

Whilst this model is perhaps somewhat simplistic, in that it does not account for the amount of scope that the worker is given to define the problem and shape the challenge, it does propose a model for discussion as to how the people management practices must evolve in order to adequately manage knowledge workers. In answering Newell et al's (2002) call to re-examine the sufficiency of best fit and best practice organisational models of HR this may be an approach which allows for devolution of HR practices in a workforce where the tried and tested methods of eliciting commitment, and satisfaction are impotent given that the common weapons of extrinsic reward and favourable labour markets are removed from the arsenal. Whilst it is somewhat akin to the AMO model (Purcell et al, 2003) it seeks to move away from the view of systemic HR models, including HPWS, and bundles of practices which would be stretched to meet the needs of the knowledge work force, particularly within the context of the IT occupations. It could be considered as more congruent with the high involvement work processes whereby psychological adjustments result from the high involvement processes which encompass knowledge power, reward and information (Vandenberg et al, 1999). It is noticeable however that both power and reward are largely inconsequential with regards to these knowledge worker archetypes.

The importance of creating challenging work calls into question whether HR practices should be more specifically tailored to the needs of specific occupational groups and be adapted over periods of time (Purcell et al, 2003). Swart and Kinnie (2013) propose that different HR configurations are required to generate performance in PSFs dependent upon the type of worker whereby *temporal segregation* would require the use of differing approaches to the workers over the course of their employment with the organisation. This could extend to the design of the job and particularly to the generation of challenge and recognition of deficit of this in the job over time. It may also be that different approaches to each of the occupational archetypes are taken (taking a targeted approach) given that the nature of the problem and the challenge are different for each occupation. However, it could be suggested that knowledge workers may no longer require particular HR practices to motivate them given their requirements of ample and appropriate problems to solve, conducive organisational cultures and simply being paid in line with the market rate. It could be suggested that organisations employing these occupational archetypes, given their impotence due to labour market conditions, may wish to enter, or at least consider entering, a post-HR era where the workers'

performance is facilitated through attention to job design and cultural conditions facilitated by front line managers who can 'bring them to life' (Purcell and Hutchinson, 2007).

#### 10.32 Reward, appraisals and motivation

The lack of interest in reward and remuneration was noted in Study 3 and it would appear from the findings, particularly in Study 3, that there are little or no extrinsic rewards which could be used to increase motivation. In the words of one web developer 'the money will come and go, it's about your experience' (WD1). These knowledge workers continually claim that generating the solution to the problem or completing the code to the customers' satisfaction is the only reward that they seek. Amabile's work suggests that motivational synergy (an appropriate combination of intrinsic and extrinsic motivators) is important in producing creative work outputs and the empirical research indicates that using extrinsic motivators at the wrong points can be highly detrimental to the creative process. The findings from Study 3 would suggest that mechanisms related to reward and performance management have a similar effect in that both are perceived to be something of a distraction to the knowledge workers. Appraisals were considered to be 'worthless' (WD3) and a 'backslapping exercise' (PR7) with the link to pay considered to be 'a giant mystery' (WD8). It was also considered that technical skills and competencies were incongruent with the generic frameworks which were designed to be used across the wider organisation which increased the disconnect between the knowledge worker archetypes and the performance systems. This would also support Hislop's (2009) observation that technical and client focused knowledge should be recognised and used as differentiators in determining approaches to managing knowledge workers. The general level of disconnect from the organisational HR processes may also be reflective of the fact that the primary foci of identification, in moderating the relationship between the job and the outcomes in the KWCM, with both archetype groups is with their team rather than the broader organisation. As causality is difficult to establish with regards to identification, it may be that the HR processes and their incongruence with the daily work reduces the level and potency of organisational identification. (This would however require further examination beyond this study and could be connected to Swart and Kinnie's (2004) study of HR practices for managing PKWs careers). Whilst formal performance management and reward mechanisms are seen by the subjects here as being superfluous to work and motivation, the culture of the organisation is perceived to be of great significance in creating an appealing work environment and is almost considered as a part of the reward package. One of the aspects of organisational culture that was described related to development activities in the exemplar organisations, which were seen by some knowledge workers as being rewards whereby specific time could be allocated to personal development which was not directly connected to their daily work. However, more generally, training and development was

considered by the interviewees to be something which they engaged in of their own volition (Hislop, 2009) and in their own time. This propensity for engaging in these learning and development activities manifested itself in Study 3 in reports of hobby development and side jobs. This calls into question the use of development opportunities (such as informal learning in Purcell et al, 2009) as HR incentives or rewards in order to generate organisational commitment. Although the desire to use HR practices to generate organisational commitment may be called into question given the importance of job challenge and team identification to these knowledge workers

### 10.33 Organisational Culture

Purcell et al (2009) presented a valuable framework for considering HR practices in relation to organisational performance for professional knowledge workers, noting the importance of the social context for HR practices and the role which this plays in the production of professional identity. Whilst the notion and value of production of professional identity may be called into question given the findings in this thesis, the role of the social context is reported by the interviewees in Study 2 and 3 as being of significance. Both web developers and programmers consider the organisational context as being important both in terms of being a relaxed working environment and also in being relatively free from politics and bureaucracy. The types of organisations which were generally attractive to both groups were those where the structure was flatter with open communication, relaxed dress code and flexible working hours. This was not considered as a 'nice to have' but rather the norm in these occupations whereby the workers would actively reject organisations that did not offer these conditions. These views of desired working conditions and organisational culture play to the social stereotypes of IT workers but they appear to be of significance in attracting and retaining these knowledge workers. One worker reported that he didn't even go to a job interview because the team profiles on the website showed the management team all wearing suits and ties, which indicated that it wasn't going to be the kind of place that he wanted to work at (WD10). Once again, this is heavily influenced by the nature of the labour market but it is nonetheless significant in effecting the knowledge workers' decisions as to whether their work environment is satisfactory. In terms of the data from Study 3 this theme emerged as being prominent when analysing the *a posteriori* codes and it should be considered as being of import when examining HR practices associated with these workers. With regards to approaches to HR strategy and practice these findings should indicate the need to consider the overarching HR philosophy of the organisation. Indeed Lepak and Snell (2002) suggest that aggregations of practices should be treated with caution with greater emphasis placed upon the HR philosophies or logics, personnel concept or 'big idea' (Alvesson, 2004; Purcell et al, 2003) which form the bedrock of the cultural and environmental conditions of the organisation. Lepak and Snell (2002) suggest that maintaining focus upon HR sub-

systems, best fit or practice approaches avoids the bigger issue of an organisation's fundamental values and approach to managing people. The data collected and presented in this thesis suggests that organisations cannot perceive themselves to have an homogenous workforce as there is demonstrable difference even within broad occupational groups such as software developers. The range of individuals surveyed and controls for the variables of organisation type and size in the data analysis suggest that organisations should account for differences at the granulated occupational level in order to consider people management practices. However it could be suggested that, given the prevalence of desire for a particular type of organisational culture that these practices should fundamentally be driven by an over arching 'big idea'. It would seem that the big idea of generating a high commitment environment should perhaps give way, in the post-industrial context (certainly in relation to web developers and programmers) to generating a low conflict, low political, casually orientated environment where job challenge is the central feature of any HR activity. It could be suggested that the figure central to generating this culture and embodying this HR philosophy in organisational life would be the line manager (Purcell et al, 2003, Purcell and Hutchinson, 2007). This role would require the ability to select a series of available and appropriate HR practices, to engage in ongoing job design and challenge creation whilst demonstrating the technical acumen to achieve this. If the line manager is seen to be crucial in bringing HR to life in organisations then the findings related to lack of respect due to levels of technical understanding need to be addressed. A shift away from high commitment work practices, which focus upon generating commitment to the organisation, to practices which create work and team focused positive outcomes (whether this is in identification or commitment terms) may be a necessary one.

#### 10.4 Key Contributions

##### 10.41 Work in the post-industrial context

The key contribution of this thesis is in its examination of work and workers in the post-industrial context. It locates work within the post-industrial context by examining knowledge workers as occupational archetypes premised upon the fact that focus upon the worker as the unit of analysis has much to offer in understanding new ways of working. The occupational type was chosen (based upon evidence from Chapter 2) as it offers a widely agreed upon reference point for post-industrial work in that software developers and software development houses are consistently used as subjects in studies of knowledge work, knowledge intensive firms and professional service firms in order to describe and hypothesise about work, managing work and organising for work in the knowledge economy. This study does not attempt to examine issues relating to knowledge per se nor does it

claim to tackle issues relating to the management of more broadly described knowledge assets in the organisational context. This research focuses upon the worker as the unit of analysis as called for by Barley and Kunda (2001) by contributing '... to an updating of conceptions of work' (p77) drawing upon the workers perspective. It also addresses the petrification which Cappelli and Keller (2013a) identify as being evident in established ideal typical occupations and formal classifications of work. This is addressed in this thesis by the establishment and granulation of archetypes by applying the most current occupational classification system to knowledge work characteristics derived from the literature, as called for by Barley and Kunda (2001). It establishes that even seemingly focused occupational archetypes (or ideal types) such as *software developer* are too broad to capture the nuances of work in the post-industrial context. The implications for understanding these nuances in terms of articulating work and occupational difference range from addressing the design of jobs for individual and organisational performance requirements to the social impact in addressing skill shortages. For example, there may be a substantial impact when these roles are presented to future workers considering their career options (Barley and Kunda, 2001) given the differences demonstrated between the two archetypal knowledge worker occupations (particularly the I/T shaped observations). The findings presented in this thesis illustrate that differences within occupational type are significant, thereby contributing to the broad discussion relating to knowledge workers in knowledge intensive settings, in suggesting that finer detail is required to fully realise the impact of occupational differentiation and the nature of work in the post-industrial context.

In relation to the nature of work in the new economy this research contributes to the recontextualisation of traditional theories as society transitions through a post-industrial context towards a neo-industrial one which is characterised by high value manufacture (Okhuysen et al, 2013). The use of the JCM, as the framework for the KWCM, highlights that there are substantial similarities over time in how work is constructed and perceived by workers but that the addition of variables can elucidate as to changing occupational forms. Analysis within this research also contributes to the extant body of work in that it examines the worker and the workers' perceptions of the work that they do and of the organisations in which they work, rather than the organisational/employer/manager perspective of work. This was a need identified by Lepak and Snell, (2002); Purcell et al, (2003); Kinnie et al, (2005) who noted that HRM research in this domain would benefit from studies which focus upon the worker rather than the organisational representatives.

The examination of knowledge worker perceptions of their work and employing organisations also contributes to the discussion as to the nature of organising for work. A key aspect of this study is that it identifies that these 'new' professionals do not organise or identify themselves in the same way that traditional professionals do. This is evident in their reports of low levels of organised professional membership and preference for ad hoc development communities (Barley and Kunda, 2004). This therefore impacts upon the way in which professional service firms can be described. von Nordenflycht (2010) in his discussion of PSFs and taxonomy development of KIFs, identifies that there are a number of potential challenges and opportunities which characterise KIFs. Indeed he describes neo-PSFs as denoting the shift from traditional professionalism to broader knowledge density, populated by workers who have substantial human capital and strong preference for autonomy, distaste for direction and formal supervision. This is identified as being the case in this thesis. However, there are degrees of difference in the occupational types which should be acknowledged. Therefore, the suggestion that, as a result, they require an organizational response of alternative incentives such as autonomy, informality and contingent compensation may be misplaced. Similarly, the opaqueness of knowledge (the extent to which it is difficult for a non-technical observer to understand the work) is viewed as being a key feature of the neo-PSF and describes some of the issues relating to line managements lack of technical knowledge described by the knowledge workers in this study. It is recognised that the findings in this thesis resonate with von Nordenflycht's (2010) taxonomy descriptors with regards to the management of knowledge workers and it responds to von Nordenflycht's call for greater understanding of contemporary professionalization, in that it offers an insight into the perceptions of workers who are archetypal workers within the neo-PSF context.

The link between the fundamentals of work and organising for work can be made in line with Puranam et al's (2014) model in that the definition of task and importance of task division/ allocation is seen to be a significant component of organising affecting the configuration of organisation. The suggestion by Puranam et al (2014) is that organising is focused around problem solving relating to organisational goals whilst the findings presented in this thesis would suggest that a more productive approach may be to organise around problem solving at the job level rather than the organisational level, taking a bottom-up approach to organising. Knowledge is also contributed to here in relation to the nature of organising around boundary spanning activities given that the findings suggest that not all knowledge workers operate in such a way with web developers being much more active in this regard than programmers, particularly when considering the I/T shape view. This research suggests that there are evidently roles which will require interaction at the permeable interface between

organisations (e.g. co-worker and client interactions) and internal sub-groups (Swart and Kinnie, 2004; Swart et al, 2005).

The focus of this thesis is upon the knowledge worker, their perceptions of their work and their employing organisations and therefore little attention has been paid to the nature of the organisational context as it is considered to be beyond the scope of this study. However, as discussed in Chapter 1 new forms of organising for work such as network organisations, boundaryless structures, tripartite contracting arrangements (Barley and Kunda, 2004) will have an effect on the way which in HR practices are formulated and operationalised. For example, issues related to frequency of work in project teams (Swart and Kinnie, 2010), increased client influence over the employment relationship (Swart et al, 2005) and multiple stakeholder relationships will impact upon the way that organisations choose to organise workers and consider HR practices. As such, this thesis begins to address understandings of contemporary work and workers in relation to ways of organising work and post-industrial, post-bureaucratic articulations of organisation by understanding nuances at the occupational level.

#### 10.42 The shifting archetype - granulation of knowledge work

In respect of the call to examine the nature of work in the knowledge economy one of the contributions of the research is that it identifies nuance within occupational categories at the level of the specific work undertaken, emphasising the need to understand the work and the way in which the worker relates to the task. It demonstrates that broad conceptualisations relating to socio-economic changes such as the knowledge economy and knowledge work can prove to be useful in allowing scholarly debate to take place and to map significant change within organisations but that there is also merit in fine definition of concepts and granulation of occupational archetypes which allows for detailed analysis of the changing context at the micro level.

#### 10.43 Methodological approach

The mixed method approach taken to this study has allowed a rich picture to emerge regarding knowledge workers constructed through large scale, global surveys and more personal, web based Skype interviews. The abstraction from the subject which can sometimes be felt in purely quantitative work was tempered here by conversations with subjects who were at ease in their own surroundings and more than happy to discuss their work. It is suggested that there is further work to be done on the use of this data collection technique particularly given the rate of technological

change and proliferation in this media. However, this study contributes to the body of knowledge of technologically facilitated methods of data collection, particularly when juxtaposed against traditional methods.

## 10.5 Limitations of the research

### 10.5.1 Limitations relating to context

Perhaps the most significant limitation of this research is that in focusing the unit of analysis to the worker it fails to account for and explore the impact of the range of contextual factors upon the workers' relationship with the organisation. The literature presented in Chapter 1 pertaining to the post-industrial context suggests that work and workers have been largely ignored whilst knowledge of organisation has been developed. In addressing this, the study of archetypes in isolation from the organisational context can create similar problems. Indeed it only details a unidirectional study of the relationship between knowledge workers and organisations where a bipartite or tripartite relationship exists in reality (Barley and Kunda (2004) recognise this by including the contract agency in their research). Individuals do not exist in isolation from the organisation in which they work and therefore this study is limited in exploring factors such as power and conflict, which Alvesson (2004) considers to be of significance in understanding knowledge workers experiences. Similarly, the organisational perspective is missing when considering the HR strategies and practices which are being devised and utilised. The importance of culture as an expression of the Personnel Concept or the 'big idea' (Alvesson 2004, Purcell et al, 2003, Hislop, 2009) should also be recognised as an heuristic for a complex set of interpersonal relationships which define and re-define the experienced environment of the organisation. This research is unable to address this issue of the complexity of culture and subtle revisions of this culture in a cross-sectional, acontextual study and therefore there is much that is not captured regarding the experienced culture of the organisation, despite using an interpretivist approach to gathering this data.

The reports from the subjects in this study do not recognise, nor do they claim to recognise actual practice or corroborated approaches to people management but represent the knowledge workers' views of these practices. This deficit could be addressed by utilising the work presented in this thesis by combining it with future empirical studies of the configurational approaches (Lepak and Snell, 2002; Swart and Kinnie, 2013) within particular occupational contexts. Combining von Nordenflycht's (2010) taxonomy of PSFs with an occupational archetype approach may allow for neo-professionalisation and related organisational context to be examined in greater depth. Similarly the focus of the individual worker outside of the organisational context does not allow for links to be

established between work and the work of organising in the post-industrial context. Factors such as boundarylessness, client and network interactions with the organisation, inter-organisational project teams (Swart et al, 2005; Swart and Kinnie, 2010) which could be described to be features of post-industrial organising are not explored in relation to the accounts within this study. Therefore, in addressing the call to re-examine work and workers in the post industrial context (as presented in Chapter 1) this study could be accused of applying the same discretion as the organisation focused studies by isolating the worker from the organisational setting. It could be argued that it is therefore left wanting in detail as to the true nature of work, which is inevitably relationally and organisationally contextualised.

#### 10.52 Limitations of measurement

In order to maintain the integrity of the JCM in testing this contemporary form of work there were some evident limitations as the scales were not as suitable as they might be in measuring some of the nuances which exist within the constructs of autonomy and feedback from the job. In expanding on the KWCM it would be useful to add to the framework by exploring these fine grained differences. Given the differences which emerged from the sample and the reconceptualisation it would have been useful to have used a creativity scale which was more sensitive to adequately identify the nuances in creative work and problem solving. However, given that this could not have been anticipated at the onset of the research project it was adequate in addressing the hypotheses and meeting the stated objectives. The opportunity sampling approach will always feel less than adequate when assessing the limitations of any research study and this could be considered to be far from ideal. Whilst the survey had responses globally the majority of the responses were from the UK and the US. Therefore it could be suggested that this may provide a particular view of knowledge work in that it is predominantly reported from a Western context. It would be difficult to generalise the data across different national contexts, such as India or sub-Saharan Africa, due to the differences in national and organisational culture and to the nature of the IT sector in those locations. However, the sample was relatively well spread globally and the responses to the call for interviewees did not exhibit any particular cultural or demographic bias. It would have been desirable for the interviewees to not have been self-selecting as this inevitably suggests that they are perhaps more vociferous about their views relating to their occupations or that these views may be more extreme than in non-volunteers. Given the focus of much HR theory on eliciting high performance from individuals it would have been of interest to examine work effectiveness as part of the KWCM but rather than a limitation of the research this could also be seen as an opportunity for

future research which includes the organisational domain through the use of case studies and performance measures.

As the data collection was cross-sectional there are limitations to the findings, as is the case with it being reliant on self-report. This could be addressed by doing a longitudinal study which looks at the KWCM over time with the archetype occupations. It may be that this would yield little difference in the results when there is already established test-retest validity. It would be beneficial however to follow the interview subjects over time as this would develop a clearer view of their relationship with their employing organisations. It would also aid in gaining an understanding of their decision making processes around leaving organisations and their career choices. It is suggested that the findings from this study specifically related to the KWCM are only generalisable within the same type of population, that is, within the same occupational groups. One cannot claim to have granulated down to a fine level of detail and then scale it back up as it will lose its specificity. The findings from the qualitative studies, particularly relating to management of IT workers are considered to be more generalisable as similar themes emerged in this aspect of the study across the groups.

#### 10.6 Future Research

It is suggested that future research could develop the contributions made in this thesis by further analysis within an occupational context. This would allow relationships to be explored in conjunction with organisational outcome variables and corroborative reports generated in context from a range of subjects. This could build upon Barley and Kunda's (2004) work of the ethnographic study of contractors, agencies and employers. Whilst not attempting to match the richness of their study it is suggested that a series of quantitative organisational studies focused upon these or similar occupational archetypes would add to the body of knowledge in this field. Use of the KWCM and additional variables relating to autonomy differentiation (Humphrey et al, 2007) and problem solving would generate insight into how job challenge is perceived and can be (re)created in organisations. Impacts of HR strategies and practices could also be examined in a relationally contextualised way with reports from different individuals (HR managers, FLMs, clients, contract agencies) connected to managing workers within the organisations. Impact of HR practices, particularly when considering using targeted and temporal approaches, upon occupational, job challenge and commitment outcomes would also be an interesting area of research. This is particularly the case given that findings in this study suggest that the job, rather than the organisation, may be considered to be the knowledge workers primary foci of commitment. The scales and concepts relating to identification and commitment could be re-evaluated in this regard. It would be of interest to include

organisational form and primary line management reference (client, project team, other stakeholder) within this study in order to understand the links between occupational archetypes and new forms of organising. Throughout this research study, themes emerged from the qualitative data which were not inherent in the original model nor were apparent in the literature review pertaining to knowledge work. Three areas which would be of interest for further research study, beyond those already mentioned relating to performance are: the notion of managing work using job challenge, I and T shaped profiles of workers and career development.

#### 10.61 Job Challenge

The model presented in Figure 10.1, derived from the aforementioned observations regarding the prevalence of challenge within the work and level of experience warrants further investigation as a strategy for managing knowledge workers. Meanings of the term 'challenge' and what constitutes a challenging problem particularly should be examined further particularly given the differences that are evident between programmers and web developers. The higher level of prove orientation evident in the web developer group may offer some insight into these differences but the notion of perceived fit between experience and challenge in relation to job satisfaction and motivation warrants further investigation. This is particularly the case given the earlier provocation that this may be a method of managing the knowledge worker when the labour market does not allow the organisation to hold the balance of power. In light of the evidence from this current research study it could also extend to examining the consequences of removing, or the absence of, appraisals and reward structure with self-management or peer-coaching mechanisms for knowledge workers.

#### 10.62 I/T Shaped Workers

It is suggested that the concepts of I shaped and T shaped workers be examined further in an attempt to establish appropriate articulations of IT work. Despite the comprehensive categorisations of jobs demonstrated in the SOC and the O\*NET data there are still questions regarding the extent to which web developers and programmers engage in transdisciplinary activities and highly specialised activities and what the impact of this might be for the workers and their organisations. The use of these terms in relation to front end and back end development should also be examined in detail in order to establish whether there is a genuine or felt difference in the work and whether this significantly effects the knowledge workers identification with their occupation. It would also be useful in demonstrating the changing nature of IT occupations and elucidate as to the skills required to conduct these different roles. Caution should be exercised here in establishing who is best placed to make these judgements, as the literature relating to the refined archetypes (Chapter 6) suggest that managers consistently desire better communication skills and business acumen which may be

irrelevant to highly specialised programming work. Cappelli (2001) similarly suggests that the perception of a skills gap may be perpetuated by managers who want more than they actually need, demanding 'the best' rather than 'good enough'. It may also be reflective of the assertion, from the knowledge workers in Study 3, that managers do not necessarily exhibit a good understanding of the technical aspects of the work.

#### 10.63 Experiences of Career

Whilst the HR practices for managing PKWs careers were examined in relation to key attitudes and perceptions by Swart et al (2004) the findings here from Study 3 suggest that the nature of career itself can be questioned in relation to these occupational archetypes. A key finding from the research was that of the need for the knowledge worker occupational archetypes to be able to pursue a career within a technical discipline rather than need to move into managerial roles to progress further. The larger, exemplar organisations recognise this and offer parallel tracks (e.g. Google, IBM). These exemplar organisations are not indicative of the majority of IT firms and therefore career progression, particularly within smaller organisations, warrants further analysis. It would be of interest to examine knowledge workers in relation to Schein's career anchors (1993). This theory includes eight career anchors which include those of autonomy/independence, pure challenge and technical/functional competence which would encompass many of the comments from Study 3. This is a frequently referred to model with relatively little empirical support but it is interesting to note that the original theory suggests that an individual is predominantly wedded to only one of these anchors. The results from Study 3 suggest that this is not the case in that these facets seem to sit together as a bundle within knowledge work. The Holland model (1985) is utilised in the O\*NET job classification system which attributes the vocational types of realistic and investigative to these occupational archetypes. Some work has been undertaken in this area (Crepeau et al 1992; Joseph et al, 2012) but it suggested that the findings from this thesis may be a valuable contribution given that other studies take a higher level view of the occupation (e.g. IS systems personnel) which may not offer as much detail as is desirable. Barley and Kunda's (2004) ethnographic work would offer a substantial contribution to the development of new knowledge in this field as it offers granular detail regarding occupation. Given the subjects' strength of feeling regarding the technical career path and the ongoing discussions about the need for challenge and problem solving it would be of interest to examine these issues further in relation to established and emerging careers theory. This may also be of import in considering the need to adequately articulate knowledge worker occupations and roles in order to encourage future generations to enter these occupations (Barley and Kunda, 2001).

## 10.7 General Conclusions

This study has examined knowledge workers, their attitudes to and perceptions of their work and the way in which they relate to organisations in which they work. The research builds upon literature relating to the context of a post-industrial setting whereby work, and organising for work, are considered to be fundamentally different from their industrial predecessors. Much of the literature pertaining to the post-industrial, post-bureaucratic settings has focused upon organising and organisational form with less attention being paid to work and workers. Discussions relating to work and workers as the unit of analysis take place in this programme of research through analysis and exploration of work as knowledge work. The programme of study addresses the research questions and objectives detailed at the start of this chapter by using a multi-method research design using IT workers as occupational archetypes. The knowledge work literature was presented in Chapter 2 detailing key models, characteristics, occupations and HR practices concluding with vignettes of knowledge worker and non-knowledge worker archetypes. There was consistent agreement that IT occupations, particularly software developers were representative of knowledge workers and therefore this archetype was used as the focus of Study 1. Software houses were also widely regarded as being knowledge intensive settings and representative of professional service firms and therefore this context was chosen for the case-study context for the exploratory study.

The exploratory study built upon the themes which emerged from the knowledge work literature and new themes also emerged from the data. In order to establish occupational archetypes and a counterpoint for discussion which built upon the vignette presented of the non-knowledge worker in Chapter 2, occupational classification data was utilised in conjunction with knowledge variables devised from the literature. Two archetypes of software developer and database/network administrator were established from the classification system. These were then presented in Chapter 5 along with the details of the literature and variables, derived from the literature review and Study 1 which made up the KWCM. Hypotheses were generated in relation to the KWCM using the knowledge worker and non-knowledge worker archetypes as the units of analysis. The occupational classification data was utilised once more in the form of a cluster analysis in order to address the poor response rate from the non-knowledge worker occupations in the survey. This analysis identified that there was significant difference within the software developer archetype whereby web developers and programmers were identified as being significantly different in relation to the knowledge work variables. The archetypes were therefore redefined and granulated to two knowledge worker archetypes. After reviewing the literature and presenting revised archetypes the KWCM and hypotheses were reconceptualised to reflect the occupational differentiation. Thus the

study developed from an examination of knowledge work in its broadest terms to an analysis of two knowledge work occupational archetypes of programmer and web developer. The global survey (Study 2) was then conducted and the findings were then presented to address the revised hypotheses. The final study developed the findings from Study 2 in relation to the KWCM variables, exploring attitudes and knowledge worker perceptions of the organisations in which they work through semi-structured interviews. Themes relating to HR practices were also explored and additional themes emerged from the data relating to the research questions.

Given the findings from this research study it is evident that problem solving, job challenge and attitudes to reward, team identification, and the broader organisational culture are of great importance in eliciting satisfaction and motivation in these knowledge worker archetypes. However, the differences which occur even between these archetypes suggest that greater emphasis needs to be placed by organisations upon the content of the job itself. The identified differences between web developers and programmers suggest that the nature of the work is fundamentally different in terms of the nature of feedback required to elicit satisfaction; the way that task identity fails to contribute to experienced meaningfulness of work for web developers; higher prove goal orientations and significance of experienced responsibility in predicting satisfaction for web developers. Feedback was found to be of greater significance for programmers and questions were raised as to whether the measure of feedback used was appropriate for measuring the web developer role.

Refinement of the knowledge worker archetypes by occupation has enabled the issue of managing these groups of workers to come markedly to the fore. This granulation of knowledge workers into two archetypes has allowed both broad assessments of knowledge workers to be made but also afforded an examination of distinctions between these archetypes. It remains the case that knowledge workers are, as a broad archetypal group, highly intrinsically motivated, autonomous individuals who are driven to learn and rise to the challenge of the job. However, there is more about the work itself which must inform management practice relating to knowledge workers. It would appear that in the occupational groups of programmers and web developers the notions of large scale HR practices, even when devolved down to line management, are inadequate in meeting the needs of the knowledge workers. It is suggested that rewards systems, performance management systems and development opportunities should be reviewed in light of the findings in this study. This is particularly the case for organisations which have a number of different types of workers but who consider them to be homogeneous. It is suggested that organisations look to

develop upon suitable configurational approaches to HR which consider both targeted and temporal segregations (Swart and Kinnie (2013). However, it is also suggested that it is not only the systems and HR practices that should be attended to but also the prevailing organisational culture which is intimately connected to the notion of the overarching HR philosophy (Lepak and Snell, 2002). The cultures described most favourably by the subjects in these studies were akin to entrepreneurial start-ups which are less bureaucratic and require fewer systems in order to function. It could be suggested that managing HR through managing the culture may be the key to dealing within such occupational heterogeneity in many organisations.

This thesis does not claim to represent all knowledge workers and types of knowledge work but focuses upon those in defined IT occupations demonstrating differences in the attitudes and perceptions of work and employing organisations in a group which is commonly aggregated under the term software developer. It is suggested as a result of the findings detailed here that work is examined more closely at the occupational level rather than in higher order terms. It could be argued that these knowledge worker occupational archetypes are somewhat unique given the labour market context in which they operate (Barley and Kunda, 2004, Cappelli, 2001). However, their desire to move job does not appear to come from the lure of higher wages elsewhere, nor do issues of retention appear to be borne from the conditions of the labour market. It would appear that these conditions provide workers with the opportunity to move if the job challenge conditions are not met. Given that the skills shortage and the rate of technological change are ongoing these knowledge workers will seemingly be operating in these conditions for some time to come. Therefore attention should be paid as to how HR strategy and practice can be best utilised to generate job challenge from well designed and continuously reconfigured jobs located within desirable work environments.

The findings from this thesis serve to illustrate that broad assertions as to the nature of knowledge work and knowledge workers from commentators such as Drucker may not prove to be complete but they are nevertheless invaluable in prompting investigation into contemporary forms of work. This thesis demonstrates that there is much of interest in examining knowledge workers as occupational archetypes, presenting a programme of research which details the attitudes and perceptions of these knowledge workers in relation to their work and employing organisations. It represents a particular moment in the development of the post-industrial context responding to the rally cry to 'bring work back in' and the call for an updating of conceptions of work (Barley and Kunda, 2001). The picture will never be fully formed as organisational forms alter and individuals' relationships with those

organisations shift. However, this thesis details an examination of a group of occupationally defined archetypal knowledge workers with findings that form a continuation of our collective understanding of what it is to work and what it is to organise for work.

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## **Appendix 1**

### Application to School Research Ethics Committee

RESEARCHER RESPONSIBLE: Joanne Carlier (Under the supervision of Dr Ann Davis and Dr Michael Butler)

RESEARCH TITLE: *Knowledge Workers and Their Relationships with Organisations*

The research study seeks to examine knowledge workers, the way that they perceive themselves in relation to their job role and the organisations in which they work. Within the literature key themes emerged relating to knowledge work/ers and management of these workers which were examined further in an exploratory study. The framework for further research is built upon these themes and is designed to test the stated hypotheses and to address the additional objectives stated below. The primary subjects for this study will be software developers (as archetypes of knowledge workers) and support specialists (non-knowledge workers) working in knowledge intensive settings. Management practices will be examined by interviewing the managers/ HR managers of the aforementioned subjects.

Hypotheses:

H 1: Knowledge workers will have lower levels of (affective) commitment to the organisation than non-knowledge workers

H 2: Knowledge workers will identify themselves more closely with their occupational community than their employing organisation

H 3: Knowledge workers will consider themselves to be more highly creative and innovative than non-knowledge workers

H4: Knowledge workers will require greater levels of creativity in their job role than non-knowledge workers in order to feel satisfied

H5: The moderating effect of creativity on the relationship between the core job characteristics and the outcomes will be greater for knowledge workers than non-knowledge workers.

H6: Knowledge workers will require greater need for work autonomy than non-knowledge workers in order to feel satisfied

H7: The moderating effect of growth need strength on the relationship between the core job characteristics and the outcomes will be greater for knowledge workers than non-knowledge workers.

H8 Knowledge workers will have a greater learning goal orientation than performance goal orientation

Additional Objectives:

- 1) To examine the types of HR activities and rationale which organisations use in managing knowledge workers.
- 2) To examine knowledge worker perceptions of HR activities used by organisations in managing knowledge workers

After successful submission of the PhD qualifying report ethical approval is now sought in order to proceed with the study.

RESEARCH DESIGN/METHODS:

Study Outlines:

Study One: Online Survey

This open-access survey will primarily focus upon piloting the survey within the software development community and will test all of the hypotheses and meet objectives 1 and 2. It will be published on the web and will target developers (knowledge workers) from the online community via discussion fora and development sites. It will also target non-knowledge

	Study One	Study Two	Study Three
Data Collection Method	Survey	Survey (KWs) Interviews (line managers and HR managers)	In-depth interviews (follow-up to Study one)
Knowledge Context	KIF and non- KIF	KIF	KIF and non-KIF
Subject type	Knowledge workers (Software developers) Non-knowledge workers	Knowledge workers (Software developers) Non-knowledge workers Managers HR Managers	Knowledge workers
Domain	Web-based	Organisational	Web-based
Documentation	Survey: Invitation Information Informed consent Debrief	Survey: Invitation Survey Information Informed consent Debrief Interview: Consent Schedule Debrief	Interview: Consent Schedule Debrief

workers using relevant sites, fora and industry publications. It should be noted that this phase of the research will gather data from participants from both knowledge intensive firms and non-knowledge intensive firms thereby allowing the relevance of context to be examined further. The survey will comprise of questions devised by the researcher relating to personal data, HR practices and the following validated and extensively used scales:

Job Diagnostic Survey (Hackman and Oldham, 1974)

Commitment scales (Meyer and Allen, 1997)

Organizational Identification Scale (Van Dick et al, 2004)

Creative Process Engagement (Zhang and Bartol, 2009)  
Creativity scale (Zhou and George, 2001)  
Graphic scale of Organisational Identification (Stuart and Kark, 2004)  
Goal Orientation Scale (VandeWalle, 1997)

The survey and related documentation are provided in Appendix One.

### Study Two: Organisational Surveys and Interviews

This study will examine subjects within an organisational context (KIF) by using the aforementioned survey (see Appendix One) and by targeting knowledge workers (software developers) and non-knowledge workers (support specialists and/or network administrators derived from the O\*Net Standard Occupational Classification Taxonomy). It will test all of the hypotheses mentioned and it will build upon these by examining the additional objectives relating to HR practices within the organisational setting. HR managers and line managers will be targeted within the organisations and in-depth, semi-structured interviews will be used to gather qualitative data particularly relating to objectives 1 and 2. See Appendix Two for interview schedules and supporting documentation.

### Phase Three: Semi-structured Interviews

Interviews will be conducted with respondents from the pilot survey. This will allow findings relating to organisational/community identity and commitment to be examined further, particularly with those respondents that are not located within organisations. These will be conducted as semi-structured interviews or web-based interviews dependent upon respondent location and preference. See Appendix Three and interview documentation from Appendix Two

**INFORMED CONSENT:** This will be given by the participants as outlined in the attached survey and interview documentation.

**ASSENT:** This will not be relevant to the type of participant in the study.

**WAIVERS OF INFORMED CONSENT:** The study will not require waivers of informed consent.

**SELECTION OF PARTICIPANTS:**

Study One: Participants will be IT workers who will be invited to complete the survey via community fora, discussion boards and professional body sites on the Internet. The survey is open to all participants globally.

Study Two: Participants will be employees of organisations and will be selected based upon their job role using convenience sampling for both the survey and the interviews. Managers for the interviews will be selected based upon their line management of appropriate types of workers. HR managers will be selected for interview according to their role and position in the organisation.

Study Three: Interviewees will be selected from the respondents from study one. If there are more potential participants than is required the sample will be randomly selected by probability sampling using the subjects' identity numbers.

#### RESEARCH PLAN FOR COLLECTION, STORAGE AND ANALYSIS OF DATA:

Data for Phases one and two will be collected using the Bristol online survey whereby all data will be stored on the BOS secure server. The data will be retrieved by the researcher using Excel and then exported into SPSS for analysis. Both BOS and the researcher's own servers are username and password protected. Data will be retained for a period of ten years after which it will be destroyed. Any manual consent forms for the interviews will be scanned and retained for ten years as will the transcriptions of the interviews and the associated audio files.

#### RISK/ANTICIPATED BENEFIT ANALYSIS:

There are no risks anticipated either during or as a result of this research either for the researchers or the participants. The research doesn't use any kind of intervention nor does it focus on vulnerable groups. The participants will receive full information as to the nature of the study, the use and storage of data and that they have the right to withdraw from the study at any time. All data collected will be anonymized and will remain confidential and secure. Benefits derived from this research are that there will be a greater understanding of this group of workers and of the efficacy of employment practices for this group which will contribute to future organisational and individual development.

#### SAFEGUARDS: CONFIDENTIALITY AND ANONYMITY:

All participants will be informed of the mechanisms for collection, storage and use of data. Data will be collected and an ID number attributed to the response. In the first and second phases the participants will be given the opportunity to include their details for future contact regarding the results of the survey and also to declare an interest in participating in the third

phase of the study. In order to protect anonymity the participant's contact details will be separated out from their responses and will only be connected by the assigned ID number for the purposes of analysis. Any personal contact details (such as email addresses) will be stored on a secure database for use as previously mentioned and as consented to by the participant. At any point the individuals may request that their name be removed from the database and

/or that they are no longer sent email updates. The respondents and their employing organisations will not be identified in the analysis or in any publication without the consent of the organisation being gained in writing.

Joanne Carlier

May 2011

## Appendix One

### Survey Documentation and Survey

## Invitation

Are you an IT worker.... developer, coder, analyst, support specialist, network administrator....?

IT professionals are often talked about as people who work in a different way and have an alternative approach to work compared to more traditional types of workers. We would like to find out a bit more about you, the way you feel about your work and the organisations you work with as well as the sorts of things you like (or don't like) about your role. This will help us to understand what types of employment practices IT workers respond to and why and perhaps more importantly what can be done to make things different!

You are invited to take part in the knowledge workers survey so that we can understand more about workers like you and what you want from your work. It should only take approx 20 minutes to complete and we would really value your participation.

If you would like be part of the knowledge workers research project please follow this link [www.knowledgeworkers.co.uk](http://www.knowledgeworkers.co.uk)

Joanne Carlier  
Aston University

## Information and consent

This survey is designed to find out more about you and the work that you do so that we can see if there are any differences in the ways that IT professionals work and how they feel about their work.

The following survey should take about 15 – 20 minutes to complete. Once your survey has been submitted it will be given a random identity number and it will be stored on a secure server. Any of the information you give will be completely anonymous and will not be attributed to you in any way. You can withdraw from the survey at any point and after completion you can withdraw your response at any point by contacting [carliejc@aston.ac.uk](mailto:carliejc@aston.ac.uk)

You don't have to provide any personal contact details at all to complete this survey but at the end of the survey you will be given the opportunity to provide contact details if you would like to be involved in further research or would like to receive further information about the survey results when they are published.

We value your participation and hope you enjoy thinking more about your job as you complete the survey.

*Information on separate survey page:*

By continuing with the survey you are giving your consent for your responses to become part of this research project.

- *Continue Button*

Survey

These questions are about you and about the organisation that you work in.

Information about you

Please write your age here: .....

Are you: Male ..... Female .....

What is your nationality?.....

What is your job title?.....

How would you describe the type of work that you do? E.g. an Internet developer, a systems analyst.....

How long have you been in this role? .....years ..... months

How long have you worked in the IT industry for? .....years .....months

If this is longer than the period you have been in this role please list your prior job roles in IT:

.....  
..

What educational/professional qualifications do you have? Please list all the qualifications you have gained. If you have Bachelors and/or Masters Degrees please state which subject they are in.

.....  
.....  
.....  
.....  
.....  
.....  
.....

Are you a member of a professional organisation? Please state which you are a member of.

.....  
....

Where you work

How long have you worked where you work now?

.....years.....months

What type of place do you work in? (Please tick the description closest to where you currently work)

- ..... Privately owned company (not owned by yourself and not floated on the stock exchange)
- ..... A company/corporation that is floated on the stock exchange and owned by share/stockholders
- ..... A public organisation (such as a government department)
- ..... I am self-employed (running your own company not for the purposes of contracting)
- ..... I am a contractor (this can also mean that you are set up as a company yourself to do this or as a sole trader but you contract your services to a specific company)

What type of sector is your current organisation in? (e.g. IT, telecommunications, finance, manufacturing)

If it is in the IT sector what type of IT work does the organisation primarily do?

How big is the organisation you work for? (If you're not entirely sure please tick your best estimate)

- |                             |                             |                               |
|-----------------------------|-----------------------------|-------------------------------|
| 1 – 4 employees .....       | 5 – 9 employees .....       | 10 – 19 employees .....       |
| 20 – 99 employees .....     | 100 – 499 employees .....   | 500 – 749 employees .....     |
| 750 – 999 employees .....   | 1000 – 1499 employees ..... | 1500 – 2499 employees .....   |
| 2500 – 4999 employees ..... | 5000 - 9999 employees ..... | 10000 or more employees ..... |

How big is the team that you directly work in?.....

Do you have any responsibility for managing other people?

No.....

Yes..... If so, how many people do you manage?..... What type of work do they do?.....

How many organisations have you worked for in your IT career so far?.....

Optional : What gross salary do you earn?.....monthly/annual

Compared to a similar job elsewhere my salary is

1. Very good in comparison
2. Good in comparison
3. Similar in comparison
4. Poor in comparison
5. Very poor in comparison

Section Six of JDS (7 point scale anchored at 4 = would like having this only a moderate amount (or less) and 10 = would like having this *extremely* much

1. High respect and fair treatment from my supervisor.
2. Stimulating and challenging work.
3. Chances to exercise independent thought and action in my job.
4. Great job security.
5. Very friendly co-workers.
6. Opportunities to learn new things from my work.
7. High salary and good fringe benefits.
8. Opportunities to be creative and imaginative in my work.
9. Quick promotions.
10. Opportunities for personal growth and development in my job.
11. A sense of worthwhile accomplishment in my work.
12. Access to new technologies

What features of your current work are most important to you? (It could be any of the answers from the previous questions or it could be something we haven't mentioned before such as it is close to your home)

.....  
..

What made you move from your last job?

Not applicable

.....  
.

## The Job Diagnostic Survey

If you are a contractor please answer the following questions thinking about the place where you are currently working. If you are working on free-lance projects please answer the questions where appropriate.

### Section One (Likert scale 1 to 7 with the descriptors annotated)

1. To what extent does your job require you to *work closely with other people* (either "clients", or people in related jobs in your own organisation)?
2. How much *autonomy* is there in your job? That is, to what extent does your job permit you to decide *on your own* how to go about doing the work?
3. To what extent does your job involve doing a "*whole*" and *identifiable piece of work*? That is, is the job a complete piece of work that has an obvious beginning and end? Or is it only a small *part* of the overall piece of work, which is finished by other people or by automatic machines.
4. How much *variety* is there in your job? That is, to what extent does the job require you to do many different things at work, using a variety of your skills and talents?
5. In general, how *significant* or *important* is your job? That is, are the results of your work likely to significantly affect the lives or well-being of other people?
6. To what extent do *managers or co-workers* let you know how well you are doing on your job?
7. To what extent does *doing the job itself* provide you with information about your work performance? That is, does the actual work itself provide clues about how well you are doing - aside from any "feedback" co-workers or supervisors may provide?

### Section Two (Likert scale 1 to 7 where 1 = very inaccurate and 7 = very accurate)

1. The job requires me to use a number of complex or high-level skills.
2. The job requires a lot of cooperative work with other people.
3. The job is arranged so that I do *not* have the chance to do an entire piece of work from beginning to end.
4. Just doing the work required by the job provides many chances for me to figure out how well I am doing.
5. The job is quite simple and repetitive.
6. The job can be done adequately by a person working alone - without talking or checking with other people.
7. The supervisors and co-workers on this job almost *never* give me "feedback" about how well I am doing in my work.
8. This job is one where a lot of other people can be affected by how well the work gets done.
9. The job denies me any chance to use my personal initiative or judgment in carrying out the work.
10. Supervisors often let me know how well they think I am performing the job.
11. The job provides me the chance to completely finish the pieces of work I begin.
12. The job itself provides very few clues about whether or not I am performing well.
13. The job gives me considerable opportunity for independence and freedom in how I do the work.

14. The job itself is *not* very significant or important in the broader scheme of things.

Section Three (Likert scale 1 to 7 where 1 = disagree strongly and 7 = agree strongly)

1. It's hard, on this job, for me to care very much about whether or not the work gets done right.
2. My opinion of myself goes up when I do this job well.
3. Generally speaking, I am very satisfied with this job.
4. Most of the things I have to do on this job seem useless or trivial.
5. I usually know whether or not my work is satisfactory on this job.
6. I feel a great sense of personal satisfaction when I do this job well.
7. The work I do on this job is very meaningful to me.
8. I feel a very high degree of *personal* responsibility for the work I do on this job.
9. I frequently think of quitting this job.
10. I feel bad and unhappy when I discover that I have performed poorly on this job.
11. I often have trouble figuring out whether I'm doing well or poorly on this job.
12. I feel I should personally take the credit or the blame for the results of my work on this job.
13. I am generally satisfied with the kind of work I do in this job.
14. My own feelings generally are *not* affected much one way or the other by how well I do on this job.
15. Whether or not this job gets done right is clearly *my* responsibility.

Section Four (Likert scale 1 to 7 where 1 = extremely dissatisfied and 7 = extremely satisfied)

1. The amount of job security I have
2. The amount of pay and fringe benefits I receive.
3. The amount of personal growth and development I get in doing my job.
4. The people I talk to and work with on my job.
5. The degree of respect and fair treatment I receive from my boss.
6. The feeling of worthwhile accomplishment I get from doing my job.
7. The chance to get to know other people while on the job.
8. The amount of support and guidance I receive from my supervisor.
9. The degree to which I am fairly paid for what I contribute to this organisation.
10. The amount of independent thought and action I can exercise in my job.
11. How secure things look for me in the future in this organization.
12. The chance to help other people while at work.
13. The amount of challenge in my job.
14. The overall quality of the supervision I receive in my work.

Section Five (Likert scale 1 to 7 with 1 being very inaccurate and 7 very accurate)

1. Most people in this job feel a great sense of personal satisfaction when they do the job well.
2. Most people on this job are very satisfied with the job.
3. Most people on this job feel that the work is useless or trivial.
4. Most people on this job feel a great deal of personal responsibility for the work they do.
5. Most people on this job have a pretty good idea of how well they are performing their work.
6. Most people on this job find the work very meaningful.

7. Most people on this job feel that whether or not the job gets done right is clearly their own responsibility.
8. People on this job often think of quitting.
9. Most people on this job feel bad or unhappy when they find that they have performed work poorly.
10. Most people on this job have trouble figuring out whether they are doing a good or bad job.

Section Seven (Five point Likert scale anchored at 1 = strongly prefer A and 5 = strongly prefer B)

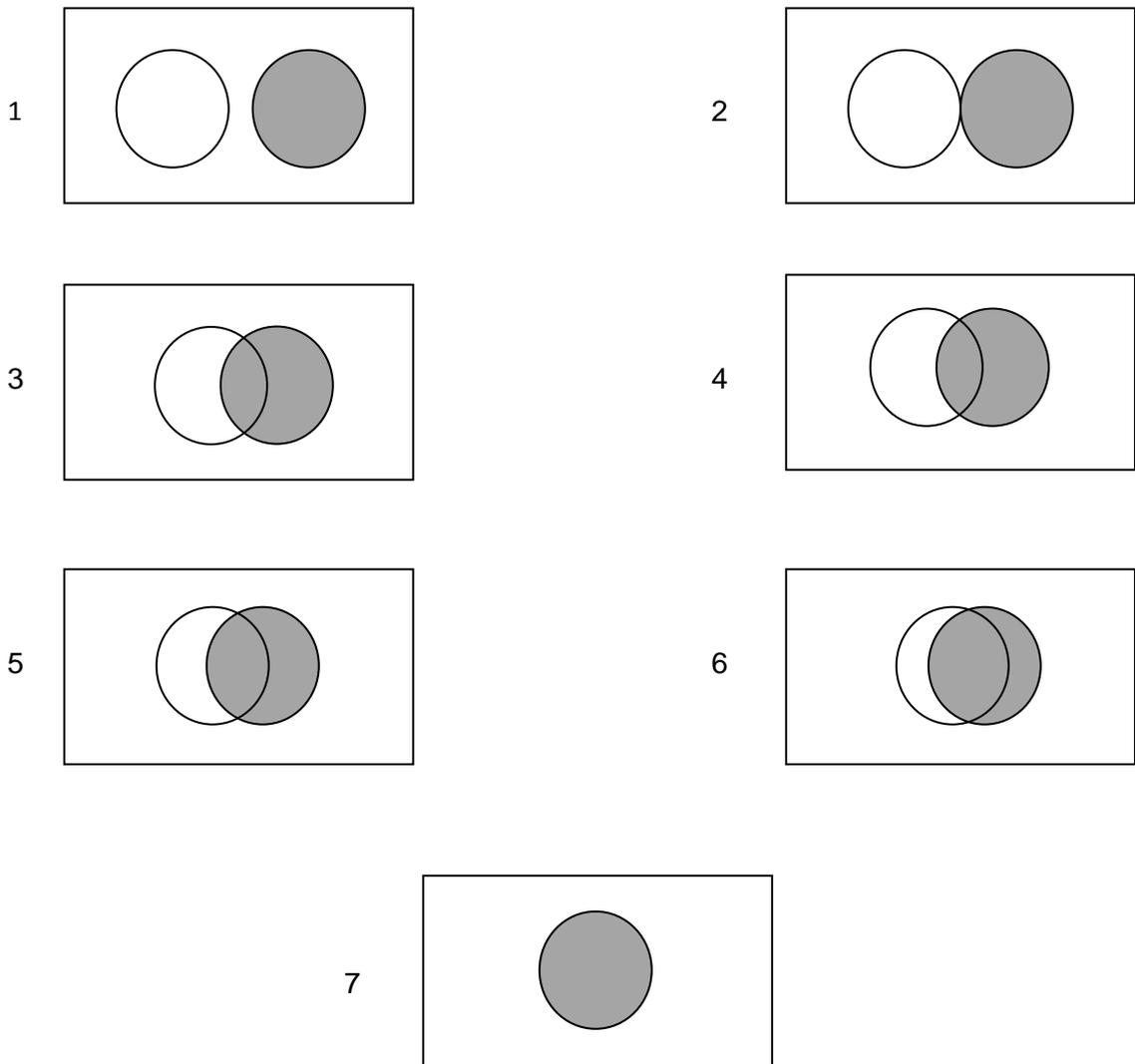
1. Job A - A job where the pay is very good.  
Job B - A job where there is considerable opportunity to be creative and innovative.
2. Job A - A job where you are often required to make important decisions.  
Job - B A job with many pleasant people to work with.
3. Job A - A job in which greater responsibility is given to those who do the best work.  
Job B - A job in which greater responsibility is given to loyal employees who have the most seniority.
4. Job A - A job in an organization which is in financial trouble - and might have to close down within the year.  
Job B - A job in which you are not allowed to have any say whatever in how your work is scheduled, or in the procedures to be used in carrying it out.
5. Job A - A very routine job.  
Job B - A job where your co-workers are not very friendly.
6. Job A - A job with a supervisor who is often very critical of you and your work in front of other people.  
Job B - A job which prevents you from using a numbers of skills that you worked hard to develop.
7. Job A - A job with a supervisor who respects you and treats you fairly.  
Job B - A job which provides constant opportunities for you to learn new and interesting things.
8. Job A - A job where there is a real chance you could be laid off.  
Job B - A job with very little chance to do challenging work.
9. Job A - A job in which there is a real chance for you to develop new skills and advance in the organization.  
Job B - A job which provides lots of vacation time and an excellent fringe benefit package.
10. Job A - A job with little freedom and independence to do your work in the way you think best.  
Job B - A job where the working conditions are poor.
11. Job A - A job with very satisfying team-work.  
Job B - A job which allows you to use your skills and abilities to the fullest extent.
12. Job A - A job which offers little or no challenge.  
Job B - A job which requires you to be completely isolated from co-workers

A graphic scale of organisational Identification (Shamir and Kark, 2004)

The chart is intended to assess your relationships with the organisation, profession and development community you belong to.

Below you will find 7 rectangles. In each rectangle there are 2 circles. One represents you and the other one the organisation/profession/development community you belong to. In each rectangle the circles are overlapping differently. In the first rectangle (number 1) they are totally separate and represent a situation in which you do not identify at all with your organisation/profession/development community. In the last rectangle (number 7), the circles are totally overlapping and represent a situation in which you totally identify with the organisation/profession/development community. Choose out of the 7 rectangles the one that most highly represents the extent to which you identify with your organisation/profession/development community.

(NOTE: The graphics will be shown for each of the categories: organisation/profession/development community and the respondent will click a target button next to their choice on each page)



Organisational Identification Scale (Van Dick et al, 2004)

(Please indicate with numbers 1 to 6 whether the statement is true for yourself: 1 = not at all, 6 = totally)

1. I identify myself as a career oriented person/ as a member of my organisation/as a member of my occupation
2. Being career oriented/a member of my organisation/ a member of my occupation reflects my personality well
3. I like to work for my career/ organization/occupation.
4. I think reluctantly of my career/organization/occupation
5. Sometimes I'd rather not say that I'm career oriented/a member of an organization/occupation
6. My career/organisation/occupation is positively judged by others
7. I work for my career/organization/occupation above what is absolutely necessary.

Goal Orientation Scale (VandeWalle, 1997)

(6 point likert-type scale 1= strongly agree to 6 = strongly disagree)

1. I am willing to select a challenging work assignment that I can learn a lot from.
2. I often look for opportunities to develop new skills and knowledge
3. I enjoy challenging and difficult tasks at work where I'll learn new skills
4. For me, development of my work ability is important enough to take risks.
5. I prefer to work in situations that require a high level of ability and talent
6. I'm concerned with showing that I can perform better than my coworkers
7. I try to figure out what it takes to prove my ability to others at work
8. I enjoy it when others at work are aware of how well I am doing
9. I prefer to work on projects where I can prove my ability to others
10. I would avoid taking on a new task if there was a chance that I would appear rather incompetent to others.
11. Avoiding a show of low ability is more important to me than learning a new skill.
12. I'm concerned about taking on a task at work if my performance would reveal that I had low ability.
13. I prefer to avoid situations at work where I might perform poorly.

Commitment Scale (Meyer and Allen, 1993)

7 point scale anchored at 1- Strongly agree and 7- strongly disagree with (R) indicating reverse scoring

*Affective Commitment Scale Items*

1. I would be very happy to spend the rest of my career in this organization.
2. I really feel as if this organization's problems are my own
3. I do not feel like "part of the family" at my organization. (R)
4. I do not feel "emotionally attached" to this organization
5. This organization has a great deal of personal meaning for me.
6. I do not feel a strong sense of belonging in my organization. (R)

*Continuance Commitment Scale Items*

1. It would be very hard for me to leave my organization right now, even if I wanted to.
2. Too much of my life would be disrupted if I decided I wanted to leave my organization right now.
3. Right now, staying with my organization is a matter of necessity as much as desire.
4. I believe that I have too few options to consider leaving this organization.
5. One of the few negative consequences of leaving this organization would be the scarcity of available alternatives.
6. If I had not already put so much myself into this organization, I might consider working elsewhere.

*Normative Commitment Scale Items*

1. I do not feel any obligation to remain with my current employer. (R)
2. Even if it were to my advantage, I do not feel it would be right to leave my organization now.
3. I would feel guilty if I left my organization now.
4. This organization deserves my loyalty
5. I would not leave my organization right now because I have a sense of obligation to the people in it.
6. I owe a great deal to my organization.

Creative Process Engagement (Zhang and Bartol, 2009)

Respondent's asked to answer the following question on a 5 point likert – type scale (1=never; 2=rarely; 3=occasionally; 4=frequently; 5= very frequently):

“In your job to what extent do you engage in the following actions when seeing to accomplish an assignment or solve a problem?”

1. I spend considerable time trying to understand the nature of the problem
2. I think about the problem from multiple perspectives
3. I deconstruct a difficult problem/assignment into parts to obtain greater understanding
4. I consult a wide variety of information
5. I search for information from multiple sources (e.g. personal memories, others' experience, documentation, Internet etc.)
6. I retain large amounts of detailed information in my area of expertise for future use
7. I consider diverse sources of information in generating new ideas
8. I look for connections with solutions used in seeming diverse areas
9. I generate a significant number of alternatives to the same problem before I choose the final solution
10. I try to devise potential solutions that move away from established ways of doing things
11. I spend considerable time sifting through information that helps to generate new ideas

Contact details

As part of the ongoing project we would like to talk to participants in further detail about IT workers and the way they perceive their work. If you would like to participate in other aspects of the research project such as follow-up interviews please enter your email address below.

Name:

Email: .....

If you would like to receive information about published findings of this research study Then please enter your email address below.

Name:

Email: .....

Thank you for your interest in the project.

*Contact details will be stored separately from your completed survey and will not be used for any other purposes other than contacting you about this research study.*

Debrief

Thank you for completing the survey. If you would like any further information about the research study or would like to withdraw your participation please email me:

[carliejc@aston.ac.uk](mailto:carliejc@aston.ac.uk)

If you have given your contact details to participate in future studies we will contact you shortly

Once again, thank you for your participation.

Joanne Carlier

## Appendix Two

Interview documentation and schedule for HR and Line Manager  
Interviews

Interview Consent Form (participant copy)

Research project: Knowledge Workers and their relationships with Organisations

Researcher: Joanne Carlier

Contact details:

Work and Organisational Psychology Group  
Aston Business School  
Aston University  
Birmingham

[carliejc@aston.ac.uk](mailto:carliejc@aston.ac.uk)

I agree to participate in this interview relating to this research project.

I have been informed of the following:

- The nature of the research project.
- The confidential nature of the interview and what is required of me.
- My right to terminate the interview at any point should I wish to do so.
- My right to decline to answer any of the questions asked of me.
- The interview will be recorded and transcribed.
- All data will be protected and stored securely.
- My privacy will be maintained and when data is used anonymity will be maintained.
- I am able to view the data collected from my participation in the project should I wish to do so

Name:

Signature:

Date:

Interview Consent Form (interviewer copy)

Research project: Knowledge Workers and their relationships with Organisations

Researcher: Joanne Carlier

Contact details:

Work and Organisational Psychology Group  
Aston Business School  
Aston University  
Birmingham

[carliejc@aston.ac.uk](mailto:carliejc@aston.ac.uk)

I agree to participate in this interview relating to this research project.

I have been informed of the following:

- The nature of the research project.
- The confidential nature of the interview and what is required of me.
- My right to terminate the interview at any point should I wish to do so.
- My right to decline to answer any of the questions asked of me.
- The interview will be recorded and transcribed.
- All data will be protected and stored securely.
- My privacy will be maintained and when data is used anonymity will be maintained.
- I am able to view the data collected from my participation in the project should I wish to do so

Name:

Signature:

Date:

## Manager Interview Schedule

Interview reference code:

Job Title:

Consent form signed:

Debrief letter issued:

Areas for discussion:

- Length of employment with the organisation
- Experience within the sector
- Type and level of technical knowledge
- Specifics of knowledge workers/non-KWs
- Exploration of differences in approach to management (if any) for KWs and non-KWs in the following areas:
  - Retention strategies
    - Opportunities
      - Goal orientation
    - Conducive environment
      - Commitment/engagement
      - Creative environment
    - Compensation strategies – link to performance
  - Motivation strategies
    - Regular communication
    - Conducive environment
    - Job design
      - Creativity

Use of creativity scale (Zhou and George, 2001) 5 point likert-type scale (1= not at all characteristic, 2= a little bit, 3= neutral, 4= characteristic, 5= very characteristic)

Please answer the following questions thinking separately about the software developers you manage in and also support specialists/database administrators you manage)

(Note: job titles here will be amended to reflect the context)

To what extent do you think the following statement is characteristic of a) software developers and b) support specialists:

These employees:

1. Suggest new ways to achieve goals or objectives
2. Come up with new and practical ideas to improve performance
3. Search out new technologies, processes, techniques and/or product ideas
4. Suggest new ways to increase quality
5. Are a good source of creative ideas
6. Are not afraid to take risks
7. Promote and champion ideas to others
8. Exhibit creativity on the job when given the opportunity to
9. Develop adequate plans and schedules for the implementation of new ideas
10. Often have new and innovative ideas
11. Come up with creative solutions to problems

12. Often have a fresh approach to problems

13. Suggest new ways of performing tasks

(Note: these questions will be set up using target buttons on the above scale with a set for KWs and non-KWs)

- Autonomy
  - Compensation
  - Opportunity – for development
- Performance Management
  - Appraisals
  - Managing performance
- Locus of activities – Responsibilities of HR/Line managers
- Exploration of challenges relating to managing KWs

## HR Manager Interview Schedule

Interview reference code:

Job Title:

Consent form signed:

Debrief letter issued:

Areas for discussion:

- Length of employment with the organisation
- Experience within the sector
- Specifics of knowledge workers
- Exploration of differences in HR strategy and practice (if any) for KWs and non-KWs in the following areas:
  - Attraction strategies
    - Compensation packages
    - External recruitment activities
    - Internal recruitment
  - Retention strategies
    - Opportunities
      - Goal orientation
    - Conducive environment
      - Commitment/engagement
      - Creative environment
    - Compensation strategies
  - Motivation strategies
    - Regular communication
    - Conducive environment
    - Job design
      - Creativity
      - Autonomy
    - Compensation
    - Opportunity
- Locus of activities – Responsibilities of HR/Line managers
- Exploration of challenges relating to managing KWs

## Interview Debrief

Thank you for participating in the interview. All responses that you have given will remain anonymous and will be securely stored

If you would like any further information about the research study, have any questions about the interview or would like to withdraw your participation please contact me by email:

[carliejc@aston.ac.uk](mailto:carliejc@aston.ac.uk)

Once again, thank you for your participation.

Joanne Carlier

## Appendix Three

### Knowledge Worker Interview Schedule

## Knowledge Worker Interview Schedule

Interview reference code:

Job Title:

Consent form signed:

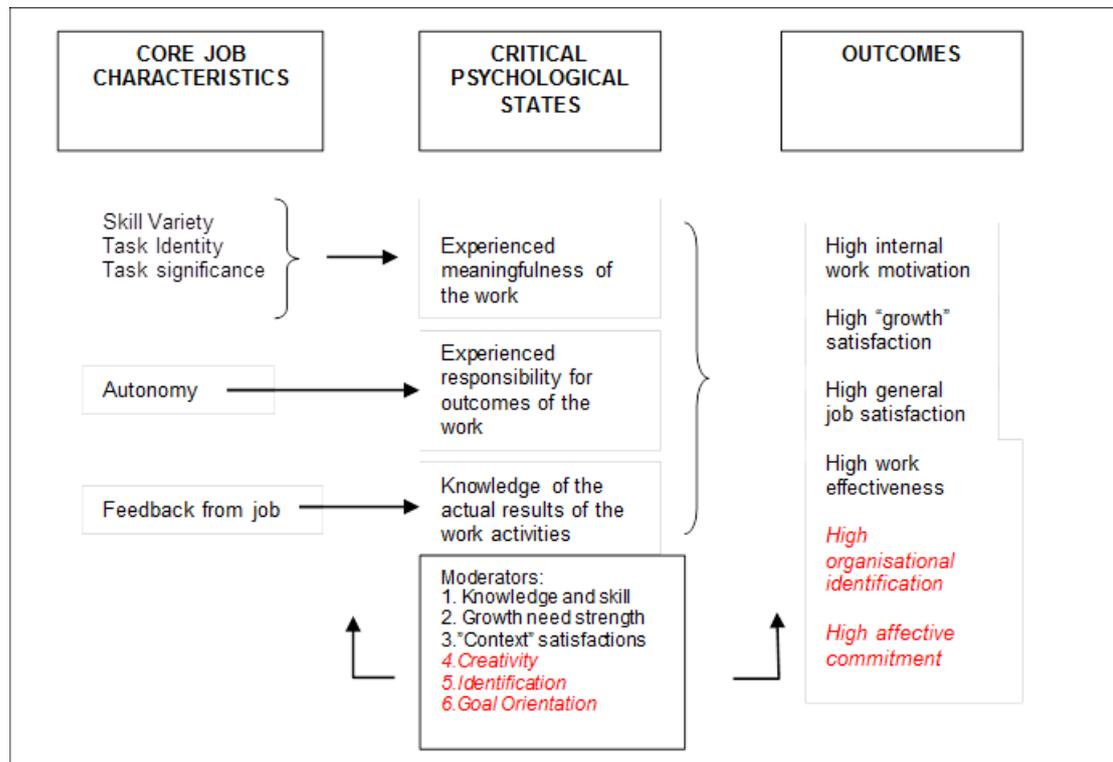
Debrief letter issued:

Areas for discussion:

- Length of employment with the organisation
- Brief discussion about career history and choice of career
  - previous employment
- Educational qualifications
- Professional memberships
  - professional affiliation and identity
- Community identification
- Importance of knowledge in your occupation
- Creativity
- Commitment
- Performance management
- Autonomy
- Job satisfaction
- Goal orientation
- Motivation
- Reward
- Experiences of performance management
- Personal development and career aspirations

## Appendix 2

Model and Hypotheses relating to testing the KWCM within the web developer and programmer archetypes



H14: Skill variety will account for the greatest amount of variance in experienced meaningfulness of work for web developers.

H15: Task identity will account for less variance in contributing to experienced meaningfulness of the work for web developers than programmers.

H16: Autonomy will account for a greater amount of variance in experienced responsibility for outcomes of the work for web developers than programmers.

H17: Feedback from the job will account for a greater amount of variance in knowledge of the results of work activities for programmers than for web developers.

H18: Experienced meaningfulness of the work will account for a greater amount of variance in internal work motivation for programmers than for web developers

H19: Experienced responsibility for outcomes of the work will account for a greater amount of variance in experiencing job satisfaction for web developers than for programmers.

H20: Web developers will identify more strongly with their team than will programmers.

H21: Web developers will identify more strongly with their organisation than will programmers.

H22: Programmers will identify more strongly with their occupation than will web developers.

H23: The moderating effect of team identification on the relationship between the core job characteristics and the outcomes will be greater for web developers than for programmers.

H24: Programmers will report higher engagement in problem identification and information searching activities than web developers.

H25: Web developers will report higher engagement in idea generation activities than programmers.

H26: The moderating effect of idea generation on the relationship between the core job characteristics and the outcomes will be higher for web developers than for programmers.

H27: Programmers will report a higher avoid goal orientation than web developers.

H28: The moderating effect of avoid orientation on the relationship between the core job characteristics and the outcomes will be greater for programmers than for web developers.

H29: Programmers will report a higher prove orientation than web developers.

H30: The moderating effect of prove orientation on the relationship between the core job characteristics and the outcomes will be greater for programmers than for web developers.

H31: There will be no difference between the web developers and the programmers in their learning orientation.

H32: Web developers will report higher affective and normative commitment than programmers.

H33: The moderating effect of organisational identification on the relationship between MPS and affective commitment will be greater for web developers than for programmers.

### **Appendix 3 Correlation Matrix for Programmers**

		Identimageorg	Identimageteam	Identimageprof	Identimagecomm	ORIENTATIONLEARNING	ORIENTATIONAVOID	ORIENTATIONPROVE	CREATIVITYPI	CREATIVITYISE
Identimageorg	Pearson Correlation	1	.586	.303	.080	-.053	-.079	-.196	-.071	.201
	Sig. (2-tailed)		.000	.001	.377	.554	.382	.029	.434	.024
	Sum of Squares and Cross-products	257.312	143.072	63.144	21.242	-6.736	-12.507	-34.476	-6.141	22.991
	Covariance	2.075	1.154	.509	.173	-.054	-.101	-.278	-.050	.185
	N	125	125	125	124	125	125	125	125	125
Identimageteam	Pearson Correlation	.586	1	.270	.151	-.034	-.012	-.108	.024	.183
	Sig. (2-tailed)	.000		.002	.094	.710	.891	.233	.786	.041
	Sum of Squares and Cross-products	143.072	231.632	53.264	38.355	-4.016	-1.861	-17.956	2.019	19.844
	Covariance	1.154	1.868	.430	.312	-.032	-.015	-.145	.016	.160
	N	125	125	125	124	125	125	125	125	125
Identimageprof	Pearson Correlation	.303	.270	1	.340	-.167	.123	.055	-.037	.099
	Sig. (2-tailed)	.001	.002		.000	.063	.172	.542	.679	.270
	Sum of Squares and Cross-products	63.144	53.264	168.528	73.710	-17.032	15.779	7.838	-2.629	9.188
	Covariance	.509	1.359	1.359	.599	-.137	.127	.063	-.021	.074
	N	125	125	125	124	125	125	125	125	125
Identimagecomm	Pearson Correlation	.080	.151	.340	1	-.081	.050	-.102	.032	-.005
	Sig. (2-tailed)	.377	.094	.000		.370	.585	.258	.723	.958
	Sum of Squares and Cross-products	21.242	38.355	73.710	278.935	-10.655	8.083	-18.734	2.909	-5.65
	Covariance	.173	.312	.599	2.268	-.087	.066	-.152	.024	-.005
	N	124	124	124	124	124	124	124	124	124
ORIENTATIONLEARNING	Pearson Correlation	-.053	-.034	-.167	-.081	1	-.484	.116	-.338	-.305
	Sig. (2-tailed)	.554	.710	.063	.370		.000	.193	.000	.001
	Sum of Squares and Cross-products	-6.736	-4.016	-17.032	-10.655	63.572	-38.715	10.191	-14.435	-17.099
	Covariance	-.054	-.032	-.137	-.087	.501	-.305	.080	-.115	-.137
	N	125	125	125	124	128	128	128	128	126
ORIENTATIONAVOID	Pearson Correlation	-.079	-.012	.123	.050	-.484	1	.252	.303	.165
	Sig. (2-tailed)	.382	.891	.172	.585	.000		.004	.001	.065
	Sum of Squares and Cross-products	-12.507	-1.861	15.779	8.083	-38.715	100.461	27.896	16.241	11.619
	Covariance	-.101	-.015	.127	.066	-.305	.791	.220	.130	.093
	N	125	125	125	124	128	128	128	126	126
ORIENTATIONPROVE	Pearson Correlation	-.196	.055	-.102	-.102	.116	.252	1	.087	.073
	Sig. (2-tailed)	.029	.233	.542	.258	.193	.004		.332	.419
	Sum of Squares and Cross-products	-34.476	-17.956	7.838	-18.734	10.191	27.896	121.816	5.216	5.706
	Covariance	-.278	-.145	.063	-.152	.080	.220	.959	.042	.046
	N	125	125	125	124	128	128	128	126	126
CREATIVITYPI	Pearson Correlation	-.071	.024	-.037	.032	-.338	.303	.087	1	.464
	Sig. (2-tailed)	.434	.786	.679	.723	.000	.001	.332	.000	.000
	Sum of Squares and Cross-products	-6.141	2.019	-2.629	2.909	-14.435	16.241	5.216	29.437	17.947
	Covariance	-.050	.016	-.021	.024	-.115	.130	.042	.235	.144
	N	125	125	125	124	126	126	126	126	126
CREATIVITYISE	Pearson Correlation	.201	.183	.099	-.005	-.305	.165	.073	.464	1
	Sig. (2-tailed)	.024	.041	.270	.958	.001	.065	.419	.000	.000
	Sum of Squares and Cross-products	22.991	19.844	9.188	-5.65	-17.099	11.619	5.706	17.947	50.795
	Covariance	.185	.160	.074	-.005	-.137	.093	.046	.144	.406
	N	125	125	125	124	126	126	126	126	126
CREATIVITYIGE	Pearson Correlation	.132	.125	.196	.059	-.304	.242	.116	.493	.611
	Sig. (2-tailed)	.143	.165	.028	.517	.001	.006	.195	.000	.000
	Sum of Squares and Cross-products	15.436	13.916	18.632	7.166	-17.488	17.496	9.376	19.545	31.829
	Covariance	.124	.112	.150	.058	-.140	.140	.075	.156	.255
	N	125	125	125	124	126	126	126	126	126
AC	Pearson Correlation	-.700	-.412	-.253	-.020	.100	-.062	.111	.083	-.085
	Sig. (2-tailed)	.000	.000	.004	.822	.260	.488	.212	.358	.344
	Sum of Squares and Cross-products	-196.205	-109.637	-57.341	-5.965	14.019	-10.875	21.519	7.839	-10.585
	Covariance	-1.582	-.884	-.462	-.048	.110	-.086	.169	.063	-.085
	N	125	125	125	124	128	128	128	126	126
CC	Pearson Correlation	.024	-.054	.028	.093	-.181	.131	-.118	.040	-.071
	Sig. (2-tailed)	.794	.550	.756	.305	.041	.142	.185	.859	.426
	Sum of Squares and Cross-products	5.495	-11.909	5.282	22.472	-20.943	19.002	-18.914	3.129	-7.400
	Covariance	.044	-.096	.043	.183	-.165	.150	-.149	.025	-.059
	N	125	125	125	124	128	128	128	126	126
NC	Pearson Correlation	-.532	-.291	-.176	.117	.123	.038	.186	.110	-.111
	Sig. (2-tailed)	.000	.001	.050	.197	.168	.668	.035	.218	.218
	Sum of Squares and Cross-products	-136.812	-70.872	-36.611	31.194	15.691	6.161	33.004	9.606	-12.637
	Covariance	-1.103	-.572	-.295	.254	.124	.049	.260	.077	-.101
	N	125	125	125	124	124	128	128	126	126

MPSCORE	Pearson Correlation	.340	.420	.188	.042	-.138	.088	-.058	.036	.160
	Sig. (2-tailed)	.000	.000	.036	.640	.120	.321	.513	.687	.871
	Sum of Squares and Cross-products	4161.214	4874.364	1862.228	536.819	-847.652	683.114	-495.702	149.980	871.309
	Covariance	33.558	39.309	15.018	4.364	-6.674	5.379	-3.903	1.200	6.970
	N	125	125	125	124	128	128	128	126	126
COMBINEDGNS	Pearson Correlation	.017	-.003	.184	.042	-.421	.284	-.030	.135	.181
	Sig. (2-tailed)	.855	.972	.040	.642	.000	.001	.734	.132	.042
	Sum of Squares and Cross-products	2.000	-.365	18.073	5.111	-25.719	21.838	-2.562	5.579	9.866
	Covariance	.016	-.003	.146	.042	-.203	.172	-.020	.045	.079
	N	125	125	125	124	128	128	128	126	126
GNSJOBCHOICE	Pearson Correlation	.072	.059	.148	-.018	-.391	.385	.014	.124	.183
	Sig. (2-tailed)	.428	.513	.099	.847	.000	.000	.874	.165	.040
	Sum of Squares and Cross-products	7.079	5.537	11.855	-1.768	-19.390	23.960	.970	4.164	8.037
	Covariance	.057	.045	.096	-.014	-.153	.189	.008	.033	.064
	N	125	125	125	124	128	128	128	126	126
WL_GNS	Pearson Correlation	-.042	-.060	.144	.081	-.280	.077	-.060	.090	.108
	Sig. (2-tailed)	.642	.503	.109	.371	.001	.387	.504	.314	.230
	Sum of Squares and Cross-products	-6.619	-9.035	18.363	12.873	-22.353	7.735	-6.581	4.912	7.677
	Covariance	-.053	-.073	.148	.105	-.176	.061	-.052	.039	.061
	N	125	125	125	124	128	128	128	126	126
SKILLVARIETY	Pearson Correlation	.337	.337	.020	-.094	-.154	.087	-.087	.096	.123
	Sig. (2-tailed)	.000	.000	.825	.297	.082	.330	.328	.284	.169
	Sum of Squares and Cross-products	65.768	62.408	3.149	-19.161	-15.050	10.646	-11.771	6.378	10.744
	Covariance	.530	.503	.025	-.156	-.119	.084	-.093	.051	.086
	N	125	125	125	124	128	128	128	126	126
TASKIDENT	Pearson Correlation	.146	.222	.079	.106	-.093	.178	.005	-.095	-.110
	Sig. (2-tailed)	.104	.013	.384	.241	.295	.044	.957	.290	.218
	Sum of Squares and Cross-products	34.391	49.577	14.988	25.911	-11.069	26.566	.800	-7.594	-11.598
	Covariance	.277	.400	.121	.211	-.087	.209	.006	-.061	-.093
	N	125	125	125	124	128	128	128	126	126
TASKSIG	Pearson Correlation	.216	.307	.073	-.083	-.092	-.053	-.111	-.026	.149
	Sig. (2-tailed)	.015	.001	.419	.360	.300	.553	.214	.771	.096
	Sum of Squares and Cross-products	53.067	71.400	14.467	-21.043	-11.494	-8.274	-19.080	-2.175	16.225
	Covariance	.428	.576	.117	-.171	-.091	-.065	-.150	-.017	.130
	N	125	125	125	124	128	128	128	126	126
AUTONOMY	Pearson Correlation	.434	.370	.119	-.114	-.171	.188	-.044	.020	.122
	Sig. (2-tailed)	.000	.000	.186	.206	.053	.033	.624	.828	.173
	Sum of Squares and Cross-products	92.717	75.037	20.575	-25.355	-18.429	25.452	-6.516	1.415	11.639
	Covariance	.748	.605	.166	-.206	-.145	.200	-.051	.011	.093
	N	125	125	125	124	128	128	128	126	126
FEEDBACKJOB	Pearson Correlation	.207	.302	.205	.136	-.061	-.018	-.042	.037	.094
	Sig. (2-tailed)	.021	.001	.022	.133	.496	.839	.635	.677	.295
	Sum of Squares and Cross-products	49.491	68.677	39.688	33.527	-7.273	-2.723	-7.023	3.037	10.006
	Covariance	.399	.554	.320	.273	-.057	-.021	-.055	.024	.080
	N	125	125	125	124	128	128	128	126	126
FEEDBACKAGENTS	Pearson Correlation	.440	.391	.251	.039	-.117	.046	-.157	-.030	.129
	Sig. (2-tailed)	.000	.000	.005	.667	.191	.608	.079	.741	.151
	Sum of Squares and Cross-products	109.406	93.169	51.277	10.297	-14.889	7.354	-27.635	-2.576	14.665
	Covariance	.889	.757	.417	.084	-.118	.058	-.219	-.021	.118
	N	124	124	124	123	127	127	127	125	125

\*\* . Correlation is significant at the 0.01 level (2-tailed).

CREATIVITY	YIGE	AC	CC	NC	MPSCORE	COMBINEDGNS	GNSJOBCHOICE	WL_GNS	SKILLVARIETY	TASKIDENT	TASKSIG	AUTONOMY	FEEDBACKJOB	FEEDBACKGENTS
.132	-.700	.024	-.532	.340	.017	.072	-.042	.337	.146	.216	-.434	.207	.440	
.143	.000	.794	.000	.000	.855	.428	.642	.000	.104	.015	.000	.021	.000	
15.436	-196.205	5.495	-136.812	4161.214	2.000	7.079	-6.619	65.768	34.391	53.067	92.717	49.491	109.406	
.124	-1.582	.044	-1.103	33.558	.016	.057	-.053	.530	.277	.428	.748	.399	.889	
.125	.125	.125	.125	.125	.125	.125	.125	.125	.125	.125	.125	.125	.124	
.125	-.412	-.054	-.291	.420	-.003	.059	-.060	.337	.222	-.307	-.370	.302	-.391	
.165	.000	.550	.001	.000	.972	.513	.503	.000	.013	.001	.000	.001	.000	
13.916	-109.637	-11.909	-70.872	4874.364	-.365	5.537	-9.035	62.408	49.577	71.400	75.037	68.677	93.169	
.112	-.884	-.096	-.572	39.309	-.003	.045	-.073	.503	.400	.576	.605	.554	.757	
.125	.125	.125	.125	.125	.125	.125	.125	.125	.125	.125	.125	.125	.124	
.196	-.253	.028	-.176	.188	.144	.144	-.144	.144	.079	.073	.119	.205	.251	
.028	.004	.756	.050	.036	.040	.099	.109	.825	.384	.419	.186	.022	.005	
18.632	-57.341	5.282	-36.611	1862.228	18.073	11.855	18.363	3.149	14.988	14.467	20.575	39.688	51.277	
.150	-.462	.043	-.295	15.018	.146	.096	-.148	.025	.121	.117	.166	.320	.417	
.125	.125	.125	.125	.125	.125	.125	.125	.125	.125	.125	.125	.125	.124	
.059	-.020	.093	.117	.042	.042	-.018	.081	-.094	.106	-.083	-.114	.136	.039	
.517	.822	.305	.197	.640	.642	.297	.371	.297	.241	.360	.206	.133	.667	
7.166	-5.965	22.472	31.194	536.819	5.111	-1.768	12.873	-19.161	25.911	-21.043	-25.355	33.527	10.297	
.058	-.048	.183	-.014	.042	.042	-.156	.105	-.156	.211	-.171	-.206	.273	.084	
.124	.124	.124	.124	.124	.124	.124	.124	.124	.124	.124	.124	.124	.123	
-.304	.100	-.181	-.123	-.138	-.421	-.391	-.280	-.154	-.093	-.171	-.092	-.117	-.117	
.001	.260	.041	.168	.120	.000	.000	.001	.082	.295	.300	.053	.496	.191	
-17.488	14.019	-20.943	15.691	-847.652	-25.719	-19.390	-22.353	-15.050	-11.069	-11.494	-18.429	-7.273	-14.889	
-.140	.110	-.165	.124	-6.674	-.203	-.153	-.176	-.119	-.087	-.091	-.145	-.057	-.118	
.126	.128	.128	.128	.128	.128	.128	.128	.128	.128	.128	.128	.128	.127	
.242	-.062	.131	.038	.088	.284	.385	.077	.087	.178	-.053	.188	-.018	.046	
.006	.488	.142	.000	.668	.321	.001	.387	.330	.044	.553	.033	.839	.608	
17.496	-10.875	19.002	6.161	683.114	21.838	23.960	7.735	10.646	26.566	-8.274	25.452	-2.723	7.354	
.140	-.086	.150	.049	.172	.172	.189	.061	.084	.209	-.065	.200	-.021	.058	
.126	.128	.128	.128	.128	.128	.128	.128	.128	.128	.128	.128	.128	.127	
.116	.111	-.118	.186	-.058	-.030	.014	-.060	-.087	.005	-.111	-.044	-.042	-.157	
.195	.212	.185	.035	.513	.734	.874	.504	.328	.957	.214	.624	.635	.079	
9.376	21.519	-18.914	33.004	-495.702	-2.562	9.70	-6.581	-11.771	8.00	-19.080	-6.516	-7.023	-27.635	
.075	.169	-.149	.260	-3.903	-.020	.008	-.052	-.093	.006	-.150	-.051	-.055	-.219	
.126	.128	.128	.128	.128	.128	.128	.128	.128	.128	.128	.128	.128	.127	
.493	.083	.040	.110	.036	.135	.124	.090	.096	-.095	-.026	.020	.037	-.030	
.000	.358	.659	.218	.687	.132	.165	.314	.284	.290	.771	.828	.677	.741	
19.545	7.839	3.129	9.606	149.980	5.579	4.164	4.912	6.378	-7.594	-2.175	1.415	3.037	-2.576	
.156	.063	.025	.033	.077	.120	.033	.039	.051	-.061	-.017	.011	.024	-.021	
.126	.126	.126	.126	.126	.126	.126	.126	.126	.126	.126	.126	.126	.125	
.611	-.085	-.071	-.111	.181	.181	.183	.108	.123	-.110	.149	.122	.094	.129	
.000	.344	.426	.218	.073	.042	.040	.230	.169	.218	.096	.173	.295	.151	
31.829	-10.585	-7.400	-12.637	871.309	9.866	8.037	7.677	10.744	-11.598	16.225	11.639	10.006	14.665	
.255	-.085	-.059	-.101	6.970	.079	.064	.061	.086	-.093	.130	.093	.080	.118	
.126	.126	.126	.126	.126	.126	.126	.126	.126	.126	.126	.126	.126	.125	
1	-.087	.041	-.059	.206	.220	.250	.104	.138	-.019	.098	.185	.141	.102	
.332	.650	.321	.013	.005	.246	.005	.124	.124	.833	.275	.038	.115	.256	
53.452	-11.149	4.330	-6.882	1149.634	12.279	11.291	7.621	12.299	-2.042	10.962	18.060	15.411	11.909	
.428	-.089	.035	-.055	9.197	.098	.090	.061	.098	-.016	.098	.144	.123	.096	
.126	.126	.126	.126	.126	.126	.126	.126	.126	.126	.126	.126	.126	.125	
-.087	1	.005	.692	-.423	-.023	-.086	.046	-.377	-.239	-.313	-.407	-.310	-.442	
.332	.953	.329	.797	.000	.000	.329	.602	.000	.006	.000	.000	.000	.000	
-11.149	311.712	1.340	200.373	-5810.360	-3.072	-9.510	8.121	-83.476	-63.367	-87.254	-99.745	-82.933	-126.271	
-.089	2.379	.010	1.530	-44.354	-.023	-.073	.062	-.637	-.484	-.666	-.761	-.633	-.971	
.126	.132	.132	.132	.132	.132	.132	.132	.132	.132	.132	.132	.132	.131	
.041	.005	1	.062	.006	.146	.130	.101	.053	.020	-.209	.148	.018	-.033	
.650	.953	.329	.797	.000	.000	.329	.602	.000	.006	.000	.000	.000	.000	
4.330	1.340	211.729	14.821	72.094	16.294	11.887	14.759	9.754	4.409	-48.114	29.932	4.067	-7.862	
.035	.010	1.616	.113	.550	.124	.091	.113	.074	.034	-.367	.228	.031	-.060	
.126	.132	.132	.132	.132	.132	.132	.132	.132	.132	.132	.132	.132	.131	
-.059	.692	.062	1	-.457	-.016	-.062	.033	-.459	-.252	-.324	-.470	-.337	-.397	
.514	.000	.479	.000	.851	.000	.480	.707	.000	.004	.000	.000	.000	.000	
-6.882	200.373	14.821	268.852	-5833.088	-2.077	-6.402	5.450	-94.409	-62.163	-84.088	-106.988	-83.778	-106.903	
-.055	1.530	.113	2.052	-44.527	-.016	-.049	.042	-.721	-.475	-.642	-.817	-.640	-.822	
.126	.132	.132	.132	.132	.132	.132	.132	.132	.132	.132	.132	.132	.131	

.206	-.423	.006	-.457	1	.135	.077	-.155	.603	.542	.557	-.705	.825	.580
.021	.000	.942	.000		.060	.357	.031	.000	.000	.000	.000	.000	.000
1149.634	-5810.360	72.094	-5833.088	891583.649	1386.625	406.510	1782.229	9202.920	9478.023	9913.526	11343.378	14016.073	11128.276
9.197	-44.354	.550	-44.527	4595.792	7.148	2.804	9.187	47.438	48.856	51.101	58.471	72.248	57.659
126	132	132	132	195	195	146	195	195	195	195	195	195	194
.220	-.023	.146	-.016	.135	.766	.843	.020	.109	.109	.100	.119	.077	.100
.013	.797	.096	.851	.060	.000	.000	.780	.131	.162	.096	.288	.166	.166
12.279	-3.072	16.294	-2.077	1386.625	148.483	40.531	138.354	3.549	21.914	20.649	22.157	15.004	22.163
.098	-.023	.124	-.016	7.148	.717	.280	.668	.018	.113	.106	.114	.077	.115
126	132	132	132	195	208	146	208	195	195	195	195	195	194
.250	-.086	.130	-.062	.077	.766	1	.237	.139	.032	.125	.090	-.033	-.001
.005	.329	.138	.480	.357	.000	.004	.095	.699	.699	.132	.282	.697	.989
11.291	-9.510	11.887	-6.402	406.510	40.531	42.990	16.578	11.690	3.337	13.596	8.535	-3.353	-.133
.090	-.073	.091	-.049	2.804	.280	.114	.081	.023	.023	.094	.059	-.023	-.001
126	132	132	132	146	146	146	146	146	146	146	146	146	145
.104	.046	.101	.033	.155	.843	.237	1	.034	.108	.098	.133	.105	.109
.246	.602	.250	.707	.031	.000	.004	.004	.634	.132	.174	.063	.144	.129
7.621	8.121	14.759	5.450	1782.229	138.354	16.578	181.543	6.755	24.458	22.509	27.690	23.064	27.192
.061	.062	.113	.042	9.187	.668	.114	.877	.035	.126	.116	.143	.119	.141
126	132	132	132	195	208	146	208	195	195	195	195	195	194
.138	-.377	.053	-.459	.603	.020	.139	.034	1	.310	.415	.469	.397	.333
.124	.000	.543	.000	.780	.000	.095	.634	.000	.000	.000	.000	.000	.000
12.299	-83.476	9.754	-94.409	9202.920	3.549	11.690	6.755	261.461	93.025	126.668	129.299	115.537	109.440
.098	-.637	.074	-.721	47.438	.018	.081	-.035	1.348	.480	.653	.666	.596	.567
126	132	132	132	195	195	146	195	195	195	195	195	195	194
-.019	-.239	.020	-.252	.542	.109	.032	.108	.310	1	.200	.437	.308	.373
.833	.006	.819	.004	.000	.131	.699	.132	.000	.000	.005	.000	.000	.000
-2.042	-63.367	4.409	-62.163	9478.023	21.914	3.337	24.458	93.025	343.455	69.975	137.881	102.802	140.947
-.016	-.484	.034	-.475	48.856	.113	.023	.126	.480	1.770	.361	.711	.530	.730
126	132	132	132	195	195	146	195	195	195	195	195	195	194
.098	-.313	-.209	-.324	.557	.100	.125	.098	.415	.200	1	.232	.387	.362
.275	.000	.016	.000	.000	.162	.132	.174	.000	.005	.001	.001	.000	.000
10.962	-87.254	-48.114	-84.088	9913.526	20.649	13.596	22.509	126.668	69.975	355.891	74.504	131.271	138.761
.088	-.666	-.367	-.642	51.101	.106	.094	.116	.653	.361	1.834	.384	.677	.719
126	132	132	132	195	195	146	195	195	195	195	195	195	194
.185	-.407	.148	-.470	.705	.119	.090	.133	.469	.437	.232	1	.366	.358
.038	.000	.090	.000	.000	.096	.282	.063	.000	.000	.001	.000	.000	.000
18.060	-99.745	29.932	-106.988	11343.378	22.157	8.535	27.690	129.299	137.881	74.504	290.302	112.218	123.907
.144	-.761	.228	-.817	58.471	.114	.059	-.143	.666	.711	.384	1.496	.578	.642
126	132	132	132	195	195	146	195	195	195	195	195	195	194
.141	-.310	.018	-.337	.825	.077	-.033	.105	.397	.308	.387	.366	1	.591
.115	.000	.834	.000	.000	.288	.697	.144	.000	.000	.000	.000	.000	.000
15.411	-82.933	4.067	-83.778	14016.073	15.004	-3.353	23.064	115.537	102.802	131.271	112.218	323.928	216.854
.123	-.633	.031	-.640	72.248	.077	-.023	.119	.596	.530	.677	.578	1.670	1.124
126	132	132	132	195	195	146	195	195	195	195	195	195	194
.102	-.442	-.033	-.397	.580	.100	-.001	.109	.333	.373	.362	.358	.591	1
.256	.000	.708	.000	.000	.166	.989	.129	.000	.000	.000	.000	.000	.000
11.909	-126.271	-7.862	-106.903	11128.276	22.163	-.133	27.192	109.440	140.947	138.761	123.907	216.854	415.572
.096	-.971	-.060	-.822	57.659	.115	-.001	.141	.567	.730	.719	.642	1.124	2.153
125	131	131	131	194	194	145	194	194	194	194	194	194	194

## **Appendix 4 Correlation Matrix for Web Developers**

		Identimageorg	Identimageteam	Identimageprof	Identimagecomm	ORIENTATIONLEARNING	ORIENTATIONAVOID	ORIENTATIONPROVE	CREATIVITYPI
Identimageorg	Pearson Correlation	1	.716	.137	.123	.069	-.006	-.119	.059
	Sig. (2-tailed)		.000	.247	.299	.572	.961	.328	.625
	Sum of Squares and Cross-products	160.164	110.301	18.781	20.589	5.497	-.493	-13.629	3.238
	Covariance	2.225	1.532	.261	.286	.080	-.007	-.198	.047
	N	73	73	73	73	70	70	70	70
Identimageteam	Pearson Correlation	.716	1	.144	.157	.031	-.007	.056	.035
	Sig. (2-tailed)	.000		.225	.184	.802	.956	.642	.773
	Sum of Squares and Cross-products	110.301	148.219	18.932	25.247	2.314	-.536	6.143	1.810
	Covariance	1.532	2.059	.263	.351	.034	-.008	.089	.026
	N	73	73	73	73	70	70	70	70
Identimageprof	Pearson Correlation	.137	.144	1	.396	-.042	.213	.125	.150
	Sig. (2-tailed)	.247	.225		.001	.730	.077	.302	.214
	Sum of Squares and Cross-products	18.781	18.932	116.959	56.548	-2.851	15.129	12.186	6.952
	Covariance	.261	.263	1.624	.785	-.041	.219	.177	.101
	N	73	73	73	73	70	70	70	70
Identimagecomm	Pearson Correlation	.123	.157	.396	1	-.089	.049	-.043	.131
	Sig. (2-tailed)	.299	.184	.001		.463	.689	.726	.281
	Sum of Squares and Cross-products	20.589	25.247	56.548	174.027	-7.326	4.189	-5.032	7.310
	Covariance	.286	.351	.785	2.417	-.106	.061	-.073	.106
	N	73	73	73	73	70	70	70	70
ORIENTATIONLEARNING	Pearson Correlation	.069	.031	-.042	-.089	1	-.262	.341	-.309
	Sig. (2-tailed)	.572	.802	.730	.463		.027	.004	.009
	Sum of Squares and Cross-products	5.497	2.314	-2.851	-7.326	41.186	-11.244	20.142	-8.552
	Covariance	.080	.034	-.041	-.106	.588	-.161	.288	-.124
	N	70	70	70	70	71	71	71	70
ORIENTATIONAVOID	Pearson Correlation	-.006	-.007	.213	.049	-.262	1	.175	.236
	Sig. (2-tailed)	.961	.956	.077	.689	.027		.144	.049
	Sum of Squares and Cross-products	-.493	-.536	15.129	4.189	-11.244	44.724	10.764	6.839
	Covariance	-.007	-.008	.219	.061	-.161	.639	.154	.099
	N	70	70	70	70	71	71	71	70
ORIENTATIONPROVE	Pearson Correlation	-.119	.056	.125	-.043	.341	.175	1	-.123
	Sig. (2-tailed)	.328	.642	.302	.726	.004	.144		.310
	Sum of Squares and Cross-products	-13.629	6.143	12.186	-5.032	20.142	10.764	84.634	-4.899
	Covariance	-.198	.089	.177	-.073	.288	.154	1.209	-.071
	N	70	70	70	70	71	71	71	70
CREATIVITYPI	Pearson Correlation	.059	.035	.150	.131	-.309	.236	-.123	1
	Sig. (2-tailed)	.625	.773	.214	.281	.009	.049	.310	
	Sum of Squares and Cross-products	3.238	1.810	6.952	7.310	-8.552	6.839	-4.899	18.865
	Covariance	.047	.026	.101	.106	-.124	.099	-.071	.273
	N	70	70	70	70	70	70	70	70
CREATIVITYISE	Pearson Correlation	-.096	-.082	.013	-.172	-.171	-.113	-.070	-.345
	Sig. (2-tailed)	.428	.498	.918	.154	.157	.354	.565	.003
	Sum of Squares and Cross-products	-6.829	-5.524	.752	12.543	-6.166	4.248	-3.624	8.476
	Covariance	-.099	-.080	.011	.182	-.089	.062	-.053	.123
	N	70	70	70	70	70	70	70	70
CREATIVITYIGE	Pearson Correlation	-.042	-.101	.145	.321	-.136	.258	-.093	.474
	Sig. (2-tailed)	.730	.405	.233	.007	.263	.031	.444	.000
	Sum of Squares and Cross-products	-3.160	-7.200	9.220	24.785	-5.182	10.324	-5.096	12.325
	Covariance	-.046	-.104	.134	.359	-.075	.150	-.074	.179
	N	70	70	70	70	70	70	70	70
AC	Pearson Correlation	-.728	-.549	-.005	-.138	.157	-.253	.102	-.329
	Sig. (2-tailed)	.000	.000	.965	.249	.190	.033	.398	.005
	Sum of Squares and Cross-products	-119.243	-86.477	-.731	-22.979	12.983	-21.747	12.052	-18.349
	Covariance	-1.679	-1.218	-.010	-.324	.185	-.311	.172	-.266
	N	72	72	72	72	71	71	71	70
CC	Pearson Correlation	-.025	.116	.136	.034	-.011	.357	.230	.203
	Sig. (2-tailed)	.837	.330	.256	.779	.930	.002	.054	.092
	Sum of Squares and Cross-products	-3.174	14.366	14.843	4.396	-.686	24.040	21.265	8.825
	Covariance	-.045	.202	.209	.062	-.010	.343	.304	.128
	N	72	72	72	72	71	71	71	70

NC	Pearson Correlation	-.389	-.373	.127	-.142	.040	-.036	-.065	.051
	Sig. (2-tailed)	.001	.001	.290	.234	.741	.769	.593	.675
	Sum of Squares and Cross-products	-61.993	-57.255	17.213	-23.063	3.181	-2.950	-7.373	2.738
	Covariance	-.873	-.806	.242	-.325	.045	-.042	-.105	.040
	N	72	72	72	72	71	71	71	70
MPSCORE	Pearson Correlation	.240	.349	.050	.254	-.218	.222	-.009	.077
	Sig. (2-tailed)	.042	.003	.679	.031	.068	.063	.942	.527
	Sum of Squares and Cross-products	1703.330	2382.276	300.400	1838.415	-794.790	843.826	-45.731	184.298
	Covariance	23.991	33.553	4.231	25.893	-11.354	12.055	-.653	2.671
	N	72	72	72	72	71	71	71	70
COMBINEDGNS	Pearson Correlation	-.120	.014	.177	.194	-.483	.337	-.129	.283
	Sig. (2-tailed)	.317	.909	.137	.102	.000	.004	.285	.018
	Sum of Squares and Cross-products	-8.981	.990	11.337	14.853	-18.189	13.218	-6.954	7.198
	Covariance	-.126	.014	.160	.209	-.260	.189	-.099	.104
	N	72	72	72	72	71	71	71	70
GNSJOBCHOICE	Pearson Correlation	-.006	.095	.215	.214	-.294	.250	-.053	.293
	Sig. (2-tailed)	.960	.426	.069	.071	.013	.036	.659	.014
	Sum of Squares and Cross-products	-.361	5.563	11.151	13.242	-8.967	7.935	-2.332	6.027
	Covariance	-.005	.078	.157	.187	-.128	.113	-.033	.087
	N	72	72	72	72	71	71	71	70
WL_GNS	Pearson Correlation	-.188	-.071	.075	.104	-.490	.298	-.155	.169
	Sig. (2-tailed)	.115	.552	.531	.384	.000	.012	.196	.161
	Sum of Squares and Cross-products	-17.419	-6.365	5.948	9.842	-22.928	14.533	-10.410	5.355
	Covariance	-.245	-.090	.084	.139	-.328	.208	-.149	.078
	N	72	72	72	72	71	71	71	70
SKILLVARIETY	Pearson Correlation	.339	.335	-.024	.089	.040	.137	.113	.170
	Sig. (2-tailed)	.004	.004	.842	.457	.740	.256	.350	.160
	Sum of Squares and Cross-products	39.097	37.102	-2.352	10.458	2.438	8.649	9.801	6.683
	Covariance	.551	.523	-.033	.147	.035	.124	.140	.097
	N	72	72	72	72	71	71	71	70
TASKIDENT	Pearson Correlation	.216	.336	.245	.136	-.096	.318	.074	.176
	Sig. (2-tailed)	.069	.004	.038	.254	.428	.007	.539	.146
	Sum of Squares and Cross-products	27.722	41.519	26.815	17.833	-6.462	22.425	7.183	7.619
	Covariance	.390	.585	.378	.251	-.092	.320	.103	.110
	N	72	72	72	72	71	71	71	70
TASKSIG	Pearson Correlation	.063	.060	-.033	-.057	.130	.016	.206	-.114
	Sig. (2-tailed)	.597	.615	.782	.632	.280	.893	.085	.347
	Sum of Squares and Cross-products	10.153	9.287	-4.537	-9.375	10.525	1.369	23.870	-6.222
	Covariance	.143	.131	-.064	-.132	.150	.020	.341	-.090
	N	72	72	72	72	71	71	71	70
AUTONOMY	Pearson Correlation	.261	.395	-.118	.162	.063	-.029	-.065	-.002
	Sig. (2-tailed)	.027	.001	.324	.175	.603	.811	.592	.989
	Sum of Squares and Cross-products	29.556	43.074	-11.407	18.667	3.910	-1.874	-5.779	-.063
	Covariance	.416	.607	-.161	.263	.056	-.027	-.083	-.001
	N	72	72	72	72	71	71	71	70
FEEDBACKJOB	Pearson Correlation	.153	.264	.092	.196	-.286	.281	-.010	-.022
	Sig. (2-tailed)	.200	.025	.444	.099	.015	.018	.936	.854
	Sum of Squares and Cross-products	20.958	34.861	10.722	27.375	-20.299	20.744	-.992	-1.056
	Covariance	.295	.491	.151	.386	-.290	.296	-.014	-.015
	N	72	72	72	72	71	71	71	70
FEEDBACKAGENTS	Pearson Correlation	.049	.341	-.001	.011	-.121	.260	.168	-.090
	Sig. (2-tailed)	.682	.003	.995	.925	.317	.028	.161	.459
	Sum of Squares and Cross-products	7.653	51.176	-.093	1.792	-9.789	22.036	19.590	-4.754
	Covariance	.108	.721	-.001	.025	-.140	.315	.280	-.069
	N	72	72	72	72	71	71	71	70

CREATIVITYISE	CREATIVITYIGE	AC	CC	NC	MPSCORE	COMBINEDGNS	GNSJOBCHOICE	WL_GNS	SKILLVARIETY	TASKIDENT	TASKSIG	AUTONOMY	FEEDBACKJOB	FEEDBACKAGENTS
-096	-042	-728	-025	-389	240	-120	-006	-188	-339	.216	.063	.261	.153	.049
.428	.730	.000	.837	.001	.042	.317	.960	.115	.004	.069	.597	.027	.200	.682
-6.829	-3.160	-119.243	-3.174	-61.993	1703.330	-8.981	-3.61	-17.419	39.097	27.722	10.153	29.556	20.958	7.653
-.099	-.046	-1.679	-.045	-.873	23.991	-.126	-.005	-.245	.551	.390	.143	.416	.295	.108
70	72	72	72	72	72	72	72	72	72	72	72	72	72	72
-.082	-.101	-.549	-.116	-.373	.349	.014	-.095	-.071	-.335	.336	.060	-.395	.264	-.341
.498	.405	.000	.330	.001	.003	.909	.426	.552	.004	.004	.615	.001	.025	.003
-5.524	-7.200	-86.477	14.366	-57.255	2382.276	.990	5.563	-6.365	37.102	41.519	9.287	43.074	34.861	51.176
-.080	-.104	-.1218	.202	-.806	.014	.078	.078	-.090	.523	.585	.131	.607	.491	.721
70	70	72	72	72	72	72	72	72	72	72	72	72	72	72
.013	-.145	-.005	.127	.050	.050	-.177	.215	.075	-.024	.245	-.033	-.118	.092	-.001
.918	.233	.965	.256	.290	.679	.137	.069	.531	.842	.038	.782	.324	.444	.995
.752	9.220	-.731	14.843	17.213	300.400	11.337	11.151	5.948	-2.352	26.815	-4.537	-11.407	10.722	-.093
.011	-.134	-.010	.209	.242	4.231	-.160	.157	.084	-.033	.378	-.064	-.161	.151	-.001
70	70	72	72	72	72	72	72	72	72	72	72	72	72	72
.172	.321	-.138	.034	-.142	.254	-.194	.214	.104	.089	.136	-.057	.162	.196	.011
.154	.007	.249	.779	.234	.031	.102	.071	.384	.457	.254	.632	.175	.099	.925
12.543	24.785	-22.979	4.396	-23.063	1838.415	14.853	13.242	9.842	10.458	17.833	-9.375	18.667	27.375	1.792
.182	.359	-.324	.062	-.325	.209	.209	.187	-.139	.147	.251	-.132	.263	.386	.025
70	70	72	72	72	72	72	72	72	72	72	72	72	72	72
-.171	-.136	.157	-.011	.040	-.483	.157	-.294	-.490	.040	-.096	.130	.063	-.286	-.121
.157	.263	.190	.930	.741	.068	.000	.013	.000	.740	.428	.280	.603	.015	.317
-6.166	-5.182	12.983	-6.886	3.181	-794.790	-18.189	-8.967	-22.928	2.438	-6.462	10.525	3.910	-20.299	-9.789
-.089	-.075	.185	-.010	.045	-11.354	-.260	-.128	-.328	.035	-.092	.150	.056	-.290	-.140
70	70	71	71	71	71	71	71	71	71	71	71	71	71	71
.113	.258	-.253	.357	-.036	.222	.337	.250	.298	.137	.318	.016	-.029	.281	.260
.354	.031	.033	.002	.769	.063	.004	.036	.012	.256	.007	.893	.811	.018	.028
4.248	10.324	-21.747	24.040	-2.950	843.826	13.218	7.935	14.533	8.649	22.425	1.369	-1.874	20.744	22.036
.062	.150	-.311	.343	-.042	12.055	.189	.113	.208	.124	.020	.320	-.027	.296	.315
70	70	71	71	71	71	71	71	71	71	71	71	71	71	71
-.070	-.093	.102	.230	-.065	-.009	-.129	-.053	-.155	.113	.074	.206	-.065	-.010	.168
.565	.444	.398	.054	.593	.942	.285	.659	.196	.350	.539	.085	.592	.936	.161
-3.624	-5.096	12.052	21.265	-7.373	-45.731	-6.954	-2.332	-10.410	9.801	7.183	23.870	-5.779	-9.992	19.590
-.053	-.074	.172	.304	-.105	-.653	-.099	-.033	-.149	.140	.103	.341	-.083	-.014	.280
70	70	71	71	71	71	71	71	71	71	71	71	71	71	71
.345	.474	-.329	.203	.051	.077	.283	.293	.169	.170	.176	-.114	-.002	-.022	-.090
.003	.000	.005	.092	.675	.527	.018	.014	.161	.160	.146	.347	.989	.854	.459
8.476	12.325	-18.349	8.825	2.738	184.298	7.198	6.027	5.355	6.683	7.619	-6.222	-.063	-1.056	-4.754
.123	.179	-.266	.128	.040	2.671	.104	.087	.078	.097	.110	-.090	-.001	-.015	-.069
70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
1	.527	-.003	-.076	.155	.030	.151	.043	.201	.077	-.171	-.361	-.020	.107	-.092
.000	.982	.532	.201	.803	.803	.212	.722	.095	.528	.157	.002	.870	.377	.448
31.943	17.853	-.194	-4.297	10.816	94.577	4.998	1.157	8.260	3.927	-9.648	-25.600	-.997	6.556	-6.343
.463	.259	-.003	-.062	.157	1.371	.072	.017	.120	.057	-.140	-.371	-.014	.095	-.092
70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
.527	1	-.114	-.007	.022	.033	.379	.297	.321	.022	-.081	-.079	-.076	.017	-.052
.000	.347	.955	.856	.786	.786	.001	.013	.007	.859	.507	.517	.530	.888	.688
17.853	35.907	-8.768	-4.101	1.637	109.082	13.302	8.418	13.976	1.170	-4.823	-5.923	-4.040	1.108	-3.805
.259	.520	-.127	-.006	.024	1.581	.193	.122	.203	.017	-.070	-.086	-.059	.016	-.055
70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
-.003	-.114	1	.043	.509	-.426	-.088	-.112	-.032	-.424	-.300	-.162	-.336	-.250	-.254
.982	.347	.717	.000	.000	.000	.451	.338	.783	.000	.009	.166	.003	.030	.028
-.194	-8.768	172.380	5.852	85.821	-3313.247	-6.972	-7.183	-3.169	-53.307	-44.053	-27.389	-44.213	-37.122	-44.447
-.003	-.127	2.329	.079	1.160	-44.774	-.094	-.097	-.043	-.720	-.595	-.370	-.597	-.502	-.601
70	70	75	75	75	75	75	75	75	75	75	75	75	75	75
-.076	-.007	.043	1	.224	.067	.150	.193	.052	-.006	.292	.031	.023	.133	.274
.532	.955	.717	.053	.567	.567	.200	.097	.657	.958	.011	.792	.846	.256	.018
-4.297	-.410	5.852	109.343	30.117	415.887	9.408	9.826	4.077	-.621	34.150	4.185	2.398	15.711	38.109
-.062	-.006	.079	1.478	.407	5.620	.127	.133	.055	-.008	.461	.057	.032	.212	.515
70	70	75	75	75	75	75	75	75	75	75	75	75	75	75

.155	.022	.509	.224	1	-419	-066	-072	-036	-426	-281	-318	-444	-200	-317
.201	.856	.000	.053		.000	.576	.541	.762	.000	.015	.005	.000	.086	.006
10.816	1.637	85.821	30.117	165.227	-3188.638	-5.076	-4.489	-3.419	-52.417	-40.370	-52.648	-57.238	-29.022	-54.260
.157	.024	1.160	.407	2.233	-069	-061	-061	-046	-708	-546	-711	-773	-392	-733
70	70	75	75	75	75	75	75	75	75	75	75	75	75	75
.030	.033	-.426	.067	-.419	1	.086	.145	.094	.629	.600	.468	.711	.759	.588
.803	.786	.000	.567	.000	.000	.368	.202	.328	.000	.000	.000	.000	.000	.000
94.577	109.082	-3313.247	415.887	-3188.638	498831.437	510.731	437.949	561.666	5825.520	5645.382	5292.938	5975.870	7033.850	6561.573
1.371	1.581	-44.774	5.620	-43.090	4493.977	4.601	5.615	5.106	52.482	50.859	47.684	53.837	63.368	59.113
70	70	75	75	75	75	112	79	111	112	112	112	112	112	112
.151	.379	-.088	.150	-.066	.086	1	.815	.840	-.069	.125	.041	-.032	.057	-.017
.212	.001	.451	.200	.576	.368		.000	.000	.468	.188	.668	.734	.551	.857
4.998	13.302	-6.972	9.408	-5.076	510.731	103.892	25.387	89.469	-7.647	14.066	5.521	-3.247	6.286	-2.296
.072	.193	-.094	.127	-.069	4.601	.852	.325	.739	-.069	.127	.050	-.029	.057	-.021
70	70	75	75	75	112	123	79	122	112	112	112	112	112	112
.043	.297	-.112	.193	-.072	.145	.815	1	.349	.006	.100	.004	-.022	.108	.119
.722	.013	.338	.097	.541	.202	.000	.000	.002	.960	.381	.972	.848	.345	.297
1.157	8.418	-7.183	9.826	-4.489	437.949	25.387	25.250	13.259	.282	5.698	.259	-1.120	6.193	8.050
.017	.122	-.097	.133	-.061	5.615	.325	.324	.172	.004	.073	.003	-.014	.103	.103
70	70	75	75	75	79	79	79	78	79	79	79	79	79	79
.201	.321	-.032	.052	-.036	.094	.840	.349	1	-.060	.137	-.002	-.063	.091	.022
.095	.007	.783	.657	.762	.328	.000	.002	.000	.534	.151	.984	.513	.344	.822
8.260	13.976	-3.169	4.077	-3.419	561.666	89.469	13.259	109.167	-6.660	15.650	-.269	-6.365	10.144	2.910
.120	.203	-.043	.055	-.046	5.106	.739	.172	.902	-.061	.142	-.002	-.058	.092	.026
70	70	75	75	75	111	122	78	122	111	111	111	111	111	111
.077	.022	-.424	-.006	-.426	.629	-.069	.006	-.060	1	.480	.235	.556	.336	.399
.528	.859	.000	.958	.000	.000	.468	.960	.534		.000	.013	.000	.000	.000
3.927	1.170	-53.307	-.621	-52.417	5825.520	-7.647	.282	-6.660	171.827	83.922	49.238	86.770	57.771	82.646
.057	.017	-.720	-.008	-.708	52.482	-.069	.004	-.061	1.548	.756	.444	.782	.520	.745
70	70	75	75	75	112	112	79	111	112	112	112	112	112	112
-.171	-.081	-.300	.292	-.281	.600	.125	.100	.137	.480	1	.279	.507	.297	.436
.157	.507	.009	.011	.015	.000	.188	.381	.151	.000	.003	.003	.000	.001	.000
-9.648	-4.823	-44.053	34.150	-40.370	5645.382	14.066	5.698	15.650	83.922	177.708	59.437	80.397	52.049	91.876
-.140	-.070	-.595	.461	-.546	50.859	.127	.073	.142	.756	1.601	.535	.724	.469	.828
70	70	75	75	75	112	112	79	111	112	112	112	112	112	112
-.361	-.079	-.162	.031	-.318	.468	.041	.004	-.002	.235	.279	1	.192	.225	.214
.002	.517	.166	.792	.005	.000	.668	.972	.984	.013	.003	.003	.042	.017	.023
-25.600	-5.923	-27.389	4.185	-52.648	5292.938	5.521	.259	-.269	49.238	59.437	255.968	36.595	47.222	54.159
-.371	-.086	-.370	.057	-.711	47.684	.050	.003	-.002	.444	.535	2.306	.330	.425	.488
70	70	75	75	75	112	112	79	111	112	112	112	112	112	112
-.020	-.076	-.336	.023	-.444	.711	-.032	-.022	-.063	.556	.507	.192	1	.290	.439
.870	.530	.003	.846	.000	.000	.734	.848	.513	.000	.000	.042	.000	.002	.000
-.997	-4.040	-44.213	2.398	-57.238	5975.870	-3.247	-1.120	-6.365	86.770	80.397	36.595	142.028	45.340	82.604
-.014	-.059	-.597	.032	-.773	53.837	-.029	-.014	-.058	.782	.724	.330	1.268	.408	.744
70	70	75	75	75	112	112	79	111	112	112	112	112	112	112
.107	.017	-.250	-.133	-.200	.759	.057	.108	.091	.336	.297	.225	.290	1	.538
.377	.888	.030	.256	.086	.000	.551	.345	.344	.000	.001	.017	.002	.000	.000
6.556	1.108	-37.122	15.711	-29.022	7033.850	6.286	6.193	10.144	57.771	52.049	47.222	45.340	172.250	111.542
.095	.016	-.502	.212	-.392	63.368	.057	.079	.092	.520	.469	.425	.408	1.552	1.005
70	70	75	75	75	112	112	79	111	112	112	112	112	112	112
-.092	-.052	-.254	.274	-.317	.588	-.017	-.119	.022	-.399	.436	.214	.439	.538	1
.448	.668	.028	.018	.006	.000	.857	.297	.822	.000	.000	.023	.000	.000	.000
-6.343	-3.805	-44.447	38.109	-54.260	6561.573	-2.296	8.050	2.910	82.646	91.876	54.159	82.604	111.542	249.658
-.092	-.055	-.601	.515	-.733	59.113	-.021	.103	.026	.745	.828	.488	.744	1.005	2.249
70	70	75	75	75	112	112	79	111	112	112	112	112	112	112