THE USE OF INFORMATION TECHNOLOGY IN LESS DEVELOPED ENVIRONMENTS

The Case of Greece

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December 1995

Thesis Summary

The main objective of this research is to examine the use of information technology (IT) in less developed environments. One of the fundamental premises of the study is that there have been disproportionately large research efforts with respect to IT in the United States and to some extent in Northern Europe compared to other regions of the world. The results of these studies are considered by those conducting them to have high degrees of generalizability; across types of organization, and across cultures and nations. However, little is actually known about the use and development of IT in less developed regions of the world. Technology may pose different problems and solutions depending on the environment, because the social processes which identify and resolve problems vary from context to context.

The research uses Greece as an example of a less developed environment with respect to IT and aims to build a profile of the use of IT there. The theoretical framework used focuses on IT use in its context, and draws from a number of sources including social psychology and organizational and management studies.

By building on the few studies that have explored the case of Greece, the research provides an analysis of the trends in IT use and development. The increasing use of networks and the dispersion of technology to regions outside the greater Athens area is displayed. The main problems that respondents have with IT use in Greece are identified and include skills and supply shortages, training, and the rapidity of technological advances. Although clusters of perceived problems exist, respondents are generally extremely satisfied with their IT operations and the contribution of IT to their business (profits, efficiency, quality etc.). Although there are wide variations in the specifics of installations between firms, the general perception of respondents has been to view themselves as having similar or superior IT to that of other firms.

Dedication

To Mum and Dad.

Acknowledgement

Many thanks are due to Pam Lewis and Pat Clark for their kind support throughout this research. The work in Greece would not have been possible without the generous help of Professor Georgios Doukidis (AUEB), Takis Lybereas (EDIGRAC), and Natasa Talandi (PRAXI/SEB) – to whom I am most grateful.

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Chapter One
Research Objective and Rationale

1.1 Preamble

The inspiration for this research project was derived from the author's work in the computing department of a major press distribution agency in Nicosia, Cyprus. The Cypriot environment, both in terms of economy and social convergence is less developed than that of many parts of the Western world. Information systems developers did not seem to use any particular methodologies. Management did not have explicit strategic plans. Planning was minimal yet change was common. It seemed that many of the assumptions of Western management theories in terms of social, political, economic, organizational, and cultural variables would be undermined in a context that was so different. The corollary of this is that if such theories were 'transferred' to that kind of environment, it is likely that the results may be considerably different from those expected. The author's main interest is in Information Management (IM) and it is in this area that the research project is focused.

1.1.1 Objectives

The main objective of this research is to examine the use of information technology (IT) in less developed environments. One of the fundamental premises of this study is that there have been disproportionately large research efforts with respect to IM and IT in the United States and to some extent in Northern Europe – than those in other regions of the world. The results of these studies are considered to have high degrees of generalizability; across types of organization, and across cultures and nations. Little is known about the use and development of IT in less developed regions of the world. It will be shown that it is in these regions where IT development and use are likely to adopt a considerably different appearance. Authors such as Barley (1990) have shown

that a technology may pose different problems and solutions depending on the environment. This is because the social processes which identify and resolve problems vary from context to context.

1.1.2 Scope

This research aims to build a profile of the use of information technology in Greece. The theoretical framework used to do this attempts to focus on IT use in its context and draws from a number of sources including social psychology and organizational and management studies.

Chapter one provides the theoretical background to the study and presents the main assumptions of the research. The next chapter provides an overview of work on 'national culture'. From this large body of literature, some salient points are highlighted, to help inform the current thesis. Chapter three discusses the methodological strategy which has been used to collect and analyse the data. Some previous research that has taken place in the same field is reviewed in order to provide a context to precede the analysis. The core of the research is contained in chapter four where the data collected by questionnaire is analysed and discussed. In the final chapter conclusions are drawn and further research is proposed.

1.2 Literature

Throughout the research a continual review of relevant literature has been undertaken. This has involved periodic searches of bibliographic databases, scans of library holdings, and the establishment of a link with the University of Athens, Economics and Business (AUEB). This process has shown that research on IT use in Greece is

scarce. There have been only a few studies and some of the most important of these are reviewed in the next chapter.

The lack of literature to review thus makes the use of a positivist methodology, where hypotheses are drawn from (amongst other things) examining the reviewed works, at least difficult and maybe impossible. This and the very nature of an information system, its interpretive flexibility (cf. section 1.4.1), occasion an interpretive, grounded, or relativist methodology.

An interpretive approach had driven much of the thinking behind the research in this thesis and has contributed to the overall research design. In practice, due to the fact that the design had been intended to cater for a more extensive investigation in the field (cf. Section 3.1 : Purpose) – and because the results shown here form only part of the larger 'plan' – difficulties in operationalizing the interpretive approach may be apparent. More specifically, the research 'tool' – the questionnaire – does not entirely 'fit' the methodological approach chosen. This is further discussed in section 3.7 (Questionnaire).

There is a growing body of work which advocates an interpretive methodology for the study of IT. It is from this work, and from others which call for interpretive methods, that the methodology for this project is derived.

One of the main problems with an interpretive approach is that which is concerned with the 'generalisability' of results. The aim is not to study a 'random sample' and use this to generate for a population – as with a positivist approach. What can be achieved is generalisation within a particular social group.

Defining a social group is problematic. Sahay et al (1994) argue that difficulties arise because of the complexity of social contexts which influence individuals' interpretations [of technology], because social groups 'cut across organizational boundaries', and because informal social networks add complexity.

Interpretive research is difficult to conduct as it often demands considerable resources (time) both at the data collection and analysis stages. Questions need to be designed to be as far as possible 'open ended'. This generates problems in the analysis due to the high volume of data that is often collected. Recent developments in computer-aided analytical tools may help to alleviate some of these problems.

As limited as dichotomies may be with respect to analytical rigour, I have (for the sake of simplicity) separated the literature into that which advocates the inclusion of social and interpretive phenomena (with respect to IT, technology generally, and methodologically), and that which proceeds with little or only rudimentary consideration of these 'softer' issues. The literatures are summarised in the next two sections. I refer to these literatures as 'socio-positive' and 'socio-negative'. I begin with a critical overview of the socio-negative literatures and go on to review socio-positive works in an attempt to assimilate a framework of ideas to help with researching the use of IT in Greece.

1.3 Socio-Negative Literature

There is a large literature which concerns itself with information management, information systems strategy, information systems development, and the like. Earl (1989) provides a good summary of the growing literature on information systems strategy in organizations. Most of this is aimed at assisting management in formulating

strategy – but are of little use in regions of the world where the idea of long term strategic management is foreign (Avgerou and Doukidis, 1993).

1.3.1 Strategic Management and IT

Earl (1989) provides a good summary of the strategic management literature and carefully integrates this with the management of IT. He presents many prescriptive frameworks to aid management in formulating and managing their IT strategies. There are clear stages in Earl's 'design'. First there are awareness, opportunity, and positioning frameworks to assist in locating one's position with respect to IT activities. Next is the formulation of IS and IT strategies, followed by the generation of IM strategy. Implementation and control strategies are then added at the end.

Much of Earl's work can be classified as 'content' theory. Taxonomies, categories, and 'recipes' typify the strategic management literature. Hornby et al (1992) who have looked at information systems development warn that to "simply provide analysts with checklists of 'things to do' [content theories] in relation to human and organizational issues (i.e. to define the human and organizational 'content' which should be covered) is to ignore the psychological and organizational complexity of the context in which the development takes place" (p. 166).

Nearly all of Earl's examples are taken from cases of large British or U.S. firms (for example, Merrill Lynch, IBM, United Airlines, British Telecom, American Hospital Supply). Although the examples are useful for illustrating particular strategic decisions, many of them are outdated and of little relevance in today's IT climate. They do however have some pedagogic value and are useful when taking an historical perspective.

Earl never considers the fact that the socio-economic and politico-economic environments, as well as the cultural, may be considerably different in the countries where his examples are taken from, than in many other regions of the world. It is also taken for granted that Earl's firms have the resources or competencies to practice 'strategic management'. Implicit in the frameworks and managerial theories that underpin them are rational and entitative themes and assumptions. These perspectives theorise technology or organizations as objects which are independent of people and which have attributes that imply a priori outcomes – regardless of context.Taken for granted are assumptions such as shared organizational values, rational behaviour and decision making, and a dominance model of 'management' (cf. Eisler, 1990).

As Avgerou and Doukidis (1993) remark; what use are the theories that are aimed at assisting management to formulate strategy in regions of the world where the idea of long term strategy is foreign? Moreover, how can we apply research that has been conducted in predominantly large firms (often multi-national corporations), to nations composed of ninety-nine per cent small firms (such as Greece)? Many of these small enterprises do not have research capabilities (implied by strategic management), or resources for long term planning – and in many cases do not understand the concepts of strategic management.

1.3.2 Impact of IT

Hirschheim (1986) discusses the literature which concerns itself with the impact of IT. He notes that "most" of this type of research proceeds with oversimplifications of technology and its impact.

Kling and Schacchi (1982) (also cited by Hirscheim) make similar observations in so far as they criticise the social and economic research of "computing developments" as being "based on a highly simplified concept of computing and social life" (p.2). Kling and Schacchi make the crucial observation that most studies of computing development ignore "the social context in which the technology is developed and used, and the history of participating organizations" (ibid.).

1.3.3 Epistemological Foundations

There is an interesting link between Kling and Scacchi's work and some of the social psychological literatures which criticise 'management' and 'organization' theory more generally for its inadequate epistemological basis (see for example, Hosking, 1988; Eisler, 1990; Dachler, 1991; Hosking and Morley, 1991; Seltsikas and Lybereas, 1995).

The problem at the level of epistemology is what Kling and Schacchi refer to as "discrete-entity" and Hosking and Morley as "entitative" perspectives. The discrete entity model (approach) is typified by 1) rational actors, 2) deterministic social effects of technology – enabled by particular 'attributes' of technology, and 3) an oversimplification or disregard for the relationship between social actors and the social and cultural context. In general, discrete entity models leave many assumptions tacit. Many such assumptions are based on "macroeconomic and sociological theories that make estimates or form hypotheses about general economic and sociological trends" (Avgerou and Doukidis, 1993; pp. 69-70). If the assumptions are 'revealed' and given careful consideration, the generalisability of results that depend on them may be in serious doubt — especially where we wish to apply these theories to areas of the world outside the United States or Northern Europe (ibid.).

The main characteristics of the entitative perspective relate closely to those described by Kling and Schacchi. The entitative perspective of organization is one which assumes 1) the organization constitutes a well defined entity which may be theorised as independent of person, 2) the organizational entity is characterised by shared goals and purposes and rational actors, 3) the organization is separate from its environment, and 4) the organization has a structure (perceived as a physical attribute); (Hosking and Morley, 1991).

The result of such perspectives is that technology and organizations are grossly oversimplified and the complex social and political relationships are ignored. Such theorising often results in producing prescriptive and 'value-free' (from a cultural perspective) 'explanations'. These are typically formulated with simple cause-effect relationships such as those Earl (1989) describes.

Hirschheim (1992) recognises the social character of information systems and carefully analyses the issue of epistemology providing a specific focus on information systems (IS) research. "Information systems epistemology", he explains, "draws heavily from the social sciences because information systems are, fundamentally, social rather than technical systems" (p.28). The methods for research that have dominated the field of IS are now being queried. "Chinks have begun to appear in the armour of the accepted scientific method, leading many to question its validity in various disciplines" (p.31). The scientific method has frequently reduced complex social relationships to simple, measurable, cause-effect relationships.

The discussion of epistemology and philosophical foundation is part of the larger debate that is concerned with 'scientific thought'. In the next section I have chosen

literature which focuses on particular problems with the history of scientific thinking and relates these directly to the information systems and organizational domains.

1.3.4 Western Science, Information Systems, and Organizations.

Checkland and Scholes (1990) refer to world view or Weltanschauung. This is a central component of their 'Soft Systems Methodology' – an approach for organizational modelling. Weltanschauungis pivotal because there is a strong relationship between the world view that we have, the knowledge that we have acquired through models, and the concept of rationality that we are using (Narasimhan, 1984).

Narasimhan explains, that in Europe in the late nineteenth century, the predominant 'scientific view' is that which is known as the Vienna school and logical empiricism. In this paradigm, "the criteria for what was rational, what constituted knowledge and what should be considered as good science were regarded as unbounded by culture and independent of time" (p.20).

Thomas Kuhn, in his seminal (1962) work (The Structure of Scientific Revolutions), criticised the Vienna School. This marked the start of some concern for considering culture and time as causal factors. The Aston Studies (Pugh and Hickson, 1976), had however provided some evidence for the 'culture-free' thesis. These studies have since been heavily criticised. Narasimhan (1984) presents an important argument – "It is therefore not possible to formulate criteria for rationality and scientific knowledge and, hence, for the construction of models that are independent of cultural and historical contexts" (Narasimhan, 1984, p.20).

Narasimhan concludes the analysis of Western science by arguing that cultural and historical contexts play a critical role. This was central to studying the international transfer of production software and is likely to be important to the study of IT and IM in general.

Even where the systems in use (organizational, social, and physical) appear to be similar to those of the software's source, Narasimhan claims that modifications are usually required to meet local user needs. The problem is that the Western view has implicit assumptions about production problems which have been formalised into computer programs for production management. Specifically, the main assumption is that planning and control can reduce or eliminate these problems. This may not hold for all contexts.

When looking at Third World industry Narasimhan notes that prima facie, it appears to operate in the same ways as 'Western' industry. This has caused expectations that software and computer systems based on western production models should be applicable in those industries too. The entitative, systems approach, that leads us to accept assumptions such as these, ignores environmental influences. Material supply is one such critical factor which differs from the 'free-flow' assumption in Western modelling. Narasimhan argues that, "a good deal of organizational behaviour can be understood only by knowing something about the environment the organisation is in and the problem it creates in obtaining resources" (p.31, emphasis added). In less developed environments, critical implicit assumptions such as those of Western models may not apply. The central question when we consider environments that are distinguished by constraints and contingencies partly not found in the West (such as Greece), is "...what is the guarantee that a Western model of production, and hence

also the computer programmes, will fit?" (ibid., emphasis added). The next section focuses on a specific example (COPICS) of a production concept which was not successfully transferred to Egypt.

1.3.5 COPICS - An Example

COPICS (Communication Oriented Production Information and Control System), was one of IBM's main application systems for the production industries. Narasimhan (in Lind, 1991) traces the transfer (and failure) of COPICS to Egyptian industry. The factors that were identified as being responsible for the failure of the COPICS model are the following:

- does not account for autonomous decision making (i.e. the extent of individual's authority to react and make 'ex-system' decisions)
- the computer initiated directives may not be semantically coherent with the language used in another culture (cf. also Madon, 1993)

and

- COPICS does not consider to what extent implications of actions, which are often implicitly assumed by the system, are realised and understood by the employees (Narasimhan, in Lind, 1991; p.44).

In summing up the failure of COPICS Narasimhan expresses a general caution with the cross-cultural transferability of software in the following; "Computer software such as application programs for production management can be regarded as a set of formalised routines, developed under assumptions of what constitutes, for example, a rational organizational behaviour or appropriate information practices. These assumptions... are based on a model where the formulation of production management problems and the solutions to those problems reflect a model of a production

environment that we call a Western model. In Egypt, however, the structure of society, the economic and technical conditions and the many diversified and non-standardised ways of solving problems may require different models" (p.52, emphasis added). In other words, context specific research and development may be required in areas of the world that do not closely resemble 'Western environments'. Greece may be one such area.

1.3.6 Group Decision Support - An Example

Tan et al (1995) looked at Group Decision Support Systems (GDSS). These are systems which are designed to improve groups' decisions by controlling their decision making environment with the provision of 'decision-enabling' technology.

What is important in Tan et al's work is that they recognise the fact that most of GDSS research has been conducted in North America and that it "may not be useful in other countries because theories grounded on one culture need not necessarily apply in other cultures" (p.82). Tan et al use 'culture' as the point of convergence for their argument. Drawing from Hofstede's (1980; 1991; and Bond, 1988; et al, 1990) and Hall and Hall's (1990) work they summarise seven dimensions of national culture (power distance, uncertainty avoidance, individualism, masculinity, time orientation, monochrony, context) and discuss 'power distance' (cf. Hofstede 1991) at length.
Tan et al's supposition is that the effects of 'power distance'(for a definition of power distance cf. figure 2.1) can create damaging group decision outcomes. What is inferred is that in some cultures, where high power distance scores are observed (e.g. Malaysia, Philippines, Mexico, Venezuela), this is likely to have detrimental effects on the decision making dynamics amongst members of a group. Tan et al believe that

"higher status group members are likely to exude considerably more influence than others" (p.83).

The implication that Tan et al want to extricate from this example, and by associating it with culture, is clearly indicated by three points that they make:

1) "Information systems (IS) theories and research, like those of management and social psychology, are heavily influenced by national culture" (p.82) .

2) "Considerable IS research has been conducted by North Americans based on observations in North American organizations or using North American subjects." (ibid.).

3) "...these theories need not necessarily apply in other cultures..." (ibid.).

Specifically referring to power distance, Tan et al note that in cultures where inequality in relationships is an accepted norm and has been so for centuries, "it is not clear whether a GSS can achieve the same effect" (p.83). If cultural effects are believed to have a significant influence on group decision processes, Tan et al's survey of empirical studies reveals a worrying conclusion. In all but one case [Watson et al, 1994] there have been no empirical studies examining cultural variables and explicitly stating the cultures in which they have been conducted.

Apart from highlighting the methodological and epistemological implications of this, including the usual fundamental problems of the generalisability of research findings, Tan et al make a more pragmatic point – "As GSS technology diffuses globally, it is

important that culture becomes a key research variable. GSS research needs to address the issue of supporting decision-making groups in different cultures" (p. 83).

To reiterate, the most important issues brought out by Tan et al's example of GSS research, are:

1) Culture is an important causal variable
2) The majority of IS/IT research is North American based
and 3) Context specific research is required.

1.3.7 Office Automation - An Example

Hirschheim (1986) who looked at office automation (OA) noted widely different views in the literature with regards the implications of OA. He suggested that this "has more to do with the values and a priori beliefs held by the particular commentator/observer than any empirical reality" (p.167). If we accept that 'values' and 'beliefs' are fundamentally what is commonly referred to as culture, and if we accept that culture varies *at least* from nation to nation (Hofstede, 1991; Hall & Hall, 1989) then this further supports the case for context-specific research.

1.3.8 Socio-Negative Conclusion

In this section I have looked at both literatures which ignore the social context within which information systems are embedded and are developed, and literatures which discuss the dangers of ignoring context. The examples illustrate the types of problems that can arise with respect to information technology development and use when a culture-free thesis is adopted.

The critiques of socio-negative literature which provide the impetus for context specific research are what this research aims to build on. The following section looks at 'socio-positive' literature. These literatures treat context and the importance of social processes as central foundations for research in information systems.

1.4 Socio-Positive Literature

Socio-positive literatures are those whose central concern is to ensure that the social character of technology and organization is recognised. The changes which have caused the 'information society' to develop are best understood with an adequate appreciation of the social and cultural environments which produced it. The development of the information society has not been uniform around the globe (Elmandjra, 1992). The next sections describe literature whose main concern is to understand the use and development of information technology or technology generally, whilst adequately relating the social and interpretive processes to the study in question. Two such literatures of particular interest are Sahay et al's (1994) work which is based mainly on Bijker et al's (1989) 'Social Construction of Technology' (SCOT) and Orlikowski's (1992) which involves the 'Duality of Technology' concept.

1.4.1 Social Construction of Technology (SCOT)

Sahay et.al (1994) draw from Bijker et al's (1989) work – 'The Social Construction of Technological Systems'. They apply the main concepts of SCOT to develop what they refer to as 'A Relativist Approach to Studying the Social Construction of Information Technology'. SCOT is an approach for studying the meanings of technology and how those meanings affect the implementation of technology. One of the central issues of SCOT is the process by which "social meaning becomes embedded into an object under study" (Sahay et al, p.249). This is known as 'social construction'. With social

construction, technological artefacts are "culturally constructed and interpreted" (Bijker et al, 1989, p.40).

The main concepts of SCOT are:

- relevant social groups
- interpretive flexibility

and

- closure.

The relevant social group is used to depict 'institutions and organizations, as well as organised or unorganised groups of individuals'. These are groups who interact with a technology and share the same set of meanings with respect to the technological artefact. For any particular technology there may be several relevant social groups. For example, the relevant social groups of a telecommunications network may be, the service provider, the customers, and the competitor. This concept is similar to the ideas of the 'actor' or 'stakeholder'. What we are mainly interested in when we consider the relevant social groups for a technology are the problems that they perceive to encounter with the technology. These may differ, depending on the meanings that groups construct for a technology.

Proponents of SCOT believe that differences in the meanings people attach to a particular technology are likely to affect its success. This can vary from context to context. Their main assumption in adopting a SCOT perspective is that 'knowledge' is socially constructed, produced through social processes. Social construction relates to Bijker et al's concept of 'interpretive flexibility'. Interpretive flexibility gives prominence to the need to study users' interpretations of the technology and describes

the differences in meanings that social groups construct for a technology. (Orlikowski and Baroudi, 1991).

Relevant social groups, identified by the common meanings and problems attached to a technology, are also seen to share variants of solutions for each problem. Bijker et al represent this network of concepts with schematics similar to the one shown below.

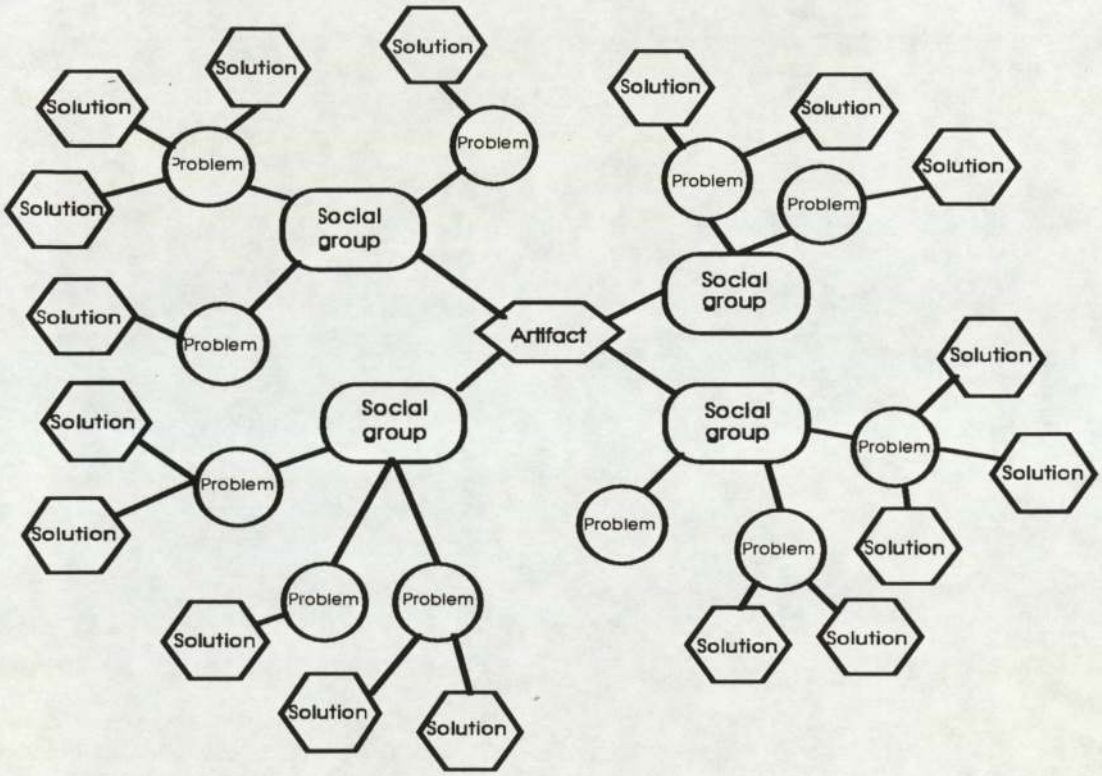

Figure 1.1 : Typical SCOT schematics.

At the centre is the technological artefact in question. This is surrounded by 'relevant social groups' which are each shown to elicit particular problems and subsequent solutions.

Closure, the last of the main concepts of SCOT, describes the process of group consensus. Closure is said to have taken place with respect to a particular technological artefact when shared understanding about the solution to a problem, within a social group, is reached. For example, Anderson's (1988) study of the Norwegian shipping industry demonstrated the differences in questions, problems, and solutions that can arise for similar problems. These were shown to depend on the different institutional settings, funding arrangements and traditions that typified the social context in question. "The fundamental concepts of social construction of technology – relevant social groups, interpretive flexibility and closure – seem directly applicable to the study of information technology in organizations. Information systems are developed and used by a variety of social groups, who approach the technology from different (often conflicting) positions of interest" (Sahay et al, 1994, p.250). SCOT recognises the dynamism of social relationships. What is interesting with SCOT is that it not only places emphasis on context, recognising that technology can be interpretively flexible in different contexts, but it recognises (via the concept of relevant social groups) the variations in interpretation of technology use *within* a particular social sphere.

In this research of IT in Greece, the concept of interpretive flexibility provides one of the central assumptions. This was considered for the design of the questionnaire which formed the basis of the field work. Orlikowski uses this concept in her structuration theory of IT (cf. section 1.4.2.7).

1.4.2 IT and Structuration Theory

One of the strongest socio-positive theses is provided by Orlikowski (1992). In this work, technology research is distinguished by the definitions of the 'role' of technology in organizations that they adopt. Orlikowski summarises three streams of

research and identifies them by the theoretical model adopted. Building on this, Orlikowski suggests the use of a 'structurational model of technology'. One of the fundamental tenets of the structurational model is that the interaction of technology and organizations is seen as "a function of the different actors and socio-historical contexts implicated in its development and use" (p. 405).

The three streams of technology research which Orlikowski identifies, distinguished by their definitions of the role played by technology in organizations, reflect the philosophical debate between subjective and objective spheres that has dominated the social sciences.

These are:

- the 'Technological Imperative' model
- the 'Strategic Choice' model

and

- the model of 'Technology as Trigger of Structural Change'.

1.4.2.1 The 'Technological Imperative' model.

Orlikowski uses the Technological Imperative Model as an example of what I have termed socio-negative literature (see section 1.3) in order to demonstrate what she wishes to avoid. The Technological Imperative Model adopts the assumption that technology has determining effects and examines the impact of technology on organizational dimensions such as structure, size, performance, and centralisation or decentralisation, as well as individual level dimensions such as job satisfaction, task complexity, skill levels, communication effectiveness, and productivity. Orlikowski criticises the body of research which adopts the Technological Imperative model as it "largely ignores the action of humans in developing, appropriating, and changing technology" (p.400). Consequently, Orlikowski believes that "this perspective

furnishes an incomplete account of technology and its interaction with organizations." (ibid.).

1.4.2.2 The 'Strategic Choice' model.

The next perspective, the Strategic Choice Model does not accept that technology is an external deterministic force, but that it is a product of ongoing human action, design, and appropriation. There are three 'research foci' within this perspective.

The first considers the physical construction of technology and lays credence in the social interactions and political choices of human actors. Technology is not seen as a causal, independent variable but is understood as being contingent on other forces in the organization, especially 'powerful human actors'. The fundamental essence of this perspective is that technology is seen as influenced by the context and the strategies of technological decision makers and users. To illustrate the Strategic Choice perspective, Orlikowski notes that "many of the case studies in Zuboff (1988) reveal, how a technology is deployed and appropriated depends on social and economic forces beyond managerial intent" (p.401).

The next research focus in the Strategic Choice perspective is similar to that of the 'relevant social group' in SCOT (see section 1.4.1). The main concern is how shared interpretations around a technology arise and the consequences this has for the development and use of that technology.

The third focus included in the Strategic Choice models is typified by Marxist perspectives of technology. With this approach technology is considered to facilitate the political and economic interests of powerful actors. This unilateral concept of

power relationships, a focus on 'powerful actors', is problematic as it does not account for the diverse ways in which a technology is appropriated and utilised by workers. What is reflected here is a dominance model (cf. section 1.3.3) where there is a dualism between management and workers, and where only managers or technology designers are seen to have the authority and means to shape the technology. The social 'role' or influences of others such as workers are minimised. Workers (others) are seen as a more or less homogeneous group of 'manipulable' and powerless persons. With respect to technology, this group of others are not seen to have choices but their actions are seen to be determined by the technology. Orlikowski sites the work of Burawoy (1985), Jönsson and Grönlund (1988), Perrow (1983), Wynne (1988), and Mohrman and Lawler (1984), whose research shows that workers may change the way technology is interpreted and operated. In 'reconstructing' the technology the workers can change the way it is used (Orlikowski, 1992, p. 402). The minimisation of workers' role in Marxist accounts of technology would seem to miss important aspects of social reality.

1.4.2.3 The model of 'Technology as Trigger of Structural Change'.

This third stream of technology research identified by Orlikowski is based on the work of Barley (1986). In this body of work, technology is seen as an "intervention into the relationship between human agents and organisational structure" (Orlikowski, 1992, p.402). What is important about this 'intervention' is that it may affect the 'relationship'. This area of research is very 'socio-positive' in that it recognises the social character of technology (as social object) but more importantly in that it identifies the fact that the meaning of technology is defined by the context of use. Barley looked at the relatively 'hard' technology of 'CT Scanners'. The suggestion was that with these types of technology physical modification is difficult as many

features and functions are fixed. However, when we consider a technology such as IT, Orlikowski notes that this is not the case. Modification in use, can and does occur, even where the technology may appear to have 'objective forms and functions'. Orlikowski argues that "these [objective forms and functions] can and do vary by different users, by different contexts of use, and by the same users over time" (p.403). The introduction of technology can thus be seen to act as a 'trigger of structural change'.

1.4.2.4 Technology and Structuration

By looking at the three main 'streams of technology research', Orlikowski wishes to build on them and show that there has been no attempt to use structuration theory to investigate the relationship between technology and organizations. A Structurational Model of Technology is based on the assumption that "Technology is created and changed by human action, yet it is also used by humans to accomplish some action" (p.405). Orlikowski refers to this notion as the 'duality of technology'. As a consequence of the duality of technology concept, Orlikowski argues that technology is 'interpretively flexible'. To do this she draws extensively from the work of Bijker (1987) (cf. section 1.4.1). With this, technology is seen to be interpretively flexible in that "the interaction of technology and organizations is a function of the different actors and socio-historical contexts implicated in its development and use" (p. 405). This is fundamental to the premises of this study of IT in Greece.

1.4.2.5 The Duality of Technology.

One of the principal notions in Orlikowski's structurational model of technology is referred to as the 'duality of technology'. With this idea, technology is considered to be a product of human action and at the same time consisting of structural properties.

More specifically, "technology is physically constructed by actors working in a given social context, and technology is socially constructed by actors through the different meanings they attach to it and the various features they emphasize and use" (p.406). Hosking and Morley (1991) refer to this social phenomenon as 'mutual creation'. The duality of technology concept would appear to be crucial to conducting contextualist research on IT.

The apparent reification of technology when its use becomes routinised consequently causes its institutionalisation. Orlikowski sees this as the way in which technology becomes part of the 'objective, structural properties of the organization'. The institutionalisation of technology embodies a temporal element. The longer a technology is in use, the less likely it is that much effort will be spent considering its operation. For example, "We do not need to physically or socially reconstruct the telephone, elevator, or typewriter every time we use it" (p.406).

1.4.2.6 Examples of the Duality of Technology

To illustrate the 'duality of technology' concept Orlikowski (1992) uses two good examples. The first concerns electronic mail; "...a company's adoption of electronic mail may have the intended consequence of increasing communication and information sharing, and the unintended consequence of reducing status barriers and social context cues" (p.406). Sometimes there may be more deep-rooted and widespread effects that influence the institutional character of a context. Orlikowski gives the example of spreadsheet use. The spreadsheet may be used to "compute an organization's annual revenues, or to create the impression of a legitimate business, but the effect of that action is to reaffirm the relevance and primacy of the "rules of accountability" established by the accounting profession" (p.406).

1.4.2.7 The Interpretive Flexibility of Technology

Interpretive flexibility is one of the main concepts of SCOT (see section 1.4.1). Orlikowski borrows this from Pinch and Bijker's work and augments the concept to her Structurational Model. The basic premise is that users of a technology may be influenced by various social factors and will interpret, appropriate, and manipulate it in particular ways – depending on social influences.

Mackay (1988) provides an excellent example of how a technology may be interpreted in different ways, depending on varying social factors, and with diverse effects in use. Users of an electronic mail system were influenced by their individual preferences and by the variations in their specific task requirements. The result was that the electronic mail system was used in different ways by different users, who integrated the system into their wider 'work system' in unique ways. Different meanings were attached to the electronic mail system by different users.

Orlikowski defines 'interpretive flexibility' as an attribute of the relationship between humans and technology with three characteristics – 1) characteristics of the material artefact (eg. hardware and software), 2) characteristics of the human agents (eg. experience, motivation), and 3) characteristics of the context (eg. social relations, task assignment, resource allocations), (Orlikowski, 1992, p.409).

Interpretive flexibility may be a concept with a good degree of validity for social studies of technology but it should be recognised that in many organizations individuals may have little control over how to use technology, and hence little discretion over which meanings and elements influence their interaction with it.

Moreover, what is important is that these constraints are not embodied in the technology itself, but are social or institutional (p.410).

1.4.2.8 Salient features of the Structurational Model

There are two salient features of the structurational model that distinguish it from other models of information systems thinking. The first deals with technology and social practices and attacks the notion of technological determinism. Technology cannot determine social practices. 'Human agency' is required when technology is used. Users can choose to work in other ways (assuming sufficient institutional flexibility) – the corollary of this being that "technology can only condition social practices" (p.411).

The second feature of the structurational model follows from the first –technology 'conditions' social practices – this is clarified by understanding that this can be in a facilitating or constraining sense; "Technology does not only constrain or enable, but rather does both" (p.411). The remainder of Orlikowski's thesis which is important to this study of IT in Greece can be summarised thus:

- when acting on technology human agents are influenced by institutional properties of their setting;
- technology is built and used within certain social and historical circumstances and its form and functioning will bear the imprint of those conditions;
- the extent to which individuals modify their use of technology depends on whether they acknowledge its constructed nature;
- the greater the temporal and spatial distance between the construction of a technology and its application, the greater the likelihood that the technology will be interpreted and used with little flexibility;

- the culture of the workplace, managerial ideology, and existing bases of expertise and power significantly influence what technologies are deployed, how they are understood, and in which ways they are used; and,
- external entities – organizations who develop 'technology', play an influential role in shaping the social practices of organizations using the technology.

"This view of technology encourages investigations of the interaction between technology and organizations that seek patterns across certain contexts and certain types of technology, rather than abstract, deterministic relationships that transcend settings, technologies, and intentions" Orlikowski (1992).

1.4.3 Contextualism

Walsham & Waema (1994) note that there is a small body of work which is concerned with "interpretations of the process by which IS strategy forms in practice and its links to implementation" (p.153). They give an example where they had studied a developing country bank. The methodology used was referred to as "contextualism". The main characteristic of contextualism is to analyse factors in the process of IS strategy, and to relate these to the organizational and wider contexts.

1.4.4 Society and Computers

Hakken (1991) compared computer development in the U.K. and the United States. In both places the research method 'participant observation' was used and the objective was to observe the effects of computer use on society. The main findings are strongly 'socio-positive'. "The correlates of computerization appear... highly contingent on social context, and thus open to social policy". Hakken comments that computer

research shows that "the character of the technology itself" is of little help in predicting 'outcomes' of computer use. Thus, theorising based on the attributes of technology (physical, existential, etc.), which may be broadly classed 'deterministic' are of little import. Hakken summarises the importance of the social context and links this to its relevance to theory by stating that "results are best understood as a consequence of a broad range of socio-cultural structurations [cf. section 1.4.2.4 - Orlikowski's model of structuration theory], including organizational cultural, class cultural, political economy, and state policy as well as technological factors" (Hakken, 1991, p.423). What is important to note is Hakken's emphasis on the cultural context. The importance of culture is discussed at length in the following chapter.

1.5 The Nature of Information Technology

Information technology has been variously defined but remains as a term that can mean many different things to many different people. A discussion of the meaning of 'information technology' is typically presented at the beginning of literatures that concern themselves with the subject. In using a relativist or interpretive approach to research this IT in Greece, a 'pre-definition' is not appropriate. The concept of 'interpretive flexibility' reflects this rationale. I wish to use a broad definition of 'information technology' – one that covers all the technologies which concern the collection, sorting, processing, use, communication, transmission and updating of any form and type of information regardless of its technical support. The research will aim to let the respondents interpret their own technological context and report on what they consider to be information technology.

The social emphasis of this research is based on the premise that information technology is particularly suitable for 'social interpretation'. This is because

information technology represents relatively few material constraints to the user. The interpretive flexibility with respect to information technology arises because actors may understand technology in different ways, and it is likely that different groups may form different interpretations. Depending on the cultural, institutional or social context, different groups may understand technology in different ways because of their unique 'frames of reference' (Orlikowski and Gash, 1994, in Sahay et al, 1994). Frames of reference, determine a group's assumptions about technology and influence the attribution of meaning. Understanding the meaning technology has for individuals can help in developing better explanations of the consequences of technology (Sahay et.al, 1994, p.248). This research has aimed not to pre-define the meaning of information technology, but to explore respondents' interpretation of their own technological context.

1.6 Organising Schema

The following schematic is an attempt to map out the overall intended design of the research. The grey area represents research that has not yet taken place.

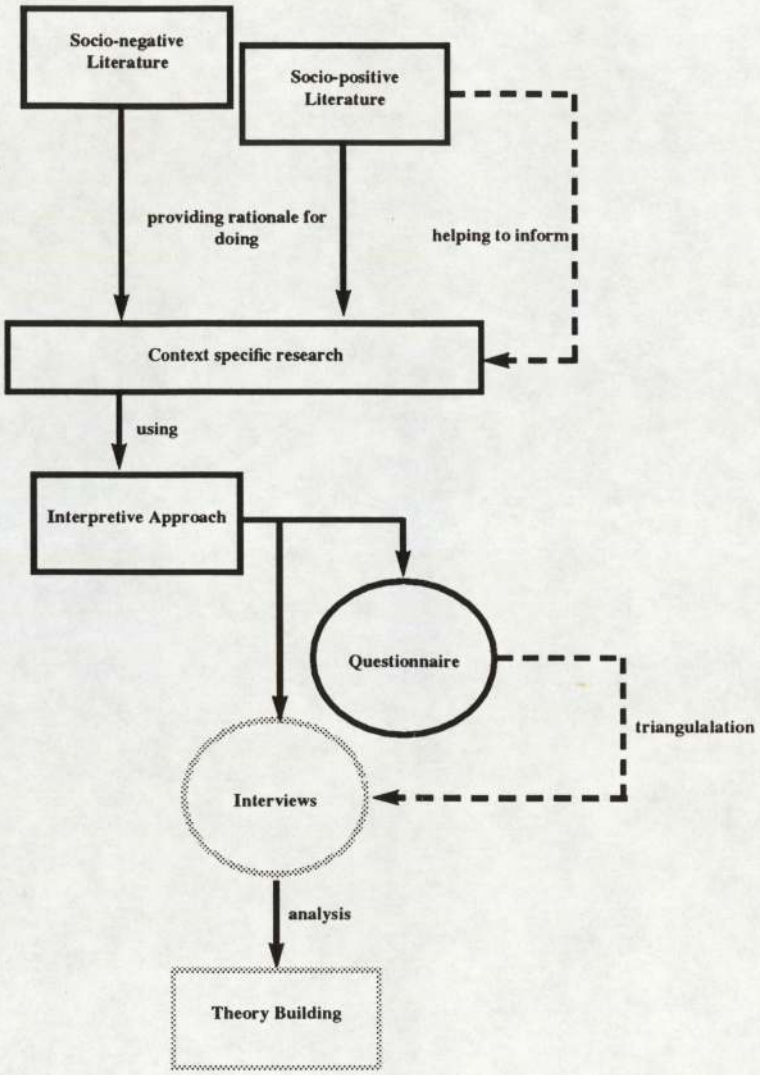

figure 1.2 : Organising Schematic

2.0 Culture

Of great importance to a study such as this, which has a 'context-specific' focus, is the large body of research which deals with culture. The term 'culture' encompasses a wide range of definitions. These vary with both the level of analysis (e.g. organizational culture, national culture) and with the epistemological foundations which are assumed (cf. section 1.3.3).

There are many 'levels of culture' that may be considered. Within each there may be 'subcultures'. For example, national culture can be regarded as consisting of other subcultures such as regional, political, industrial, and class-based. Hofstede (1990) notes that although subcultures exist, most of these will "still share common traits with other subcultures, which make their members recognisable to foreigners as belonging to that society" (p.21).

In this research, respondents may share similar subcultural traits in that they are all associated with light manufacturing, are mostly well educated, are nearly all 'managers', and more importantly they all belong to Greek society. Some cultural differences may be accounted for if we were to look at regional culture because the geographical locations of the respondents are diverse (cf. Section 4.3). The work which concerns national culture is that which is most useful to the study of IT in Greece and appropriate given the level of analysis at which the data has been collected.

Feldman and March (1981) considered the use of information in organizations as being highly symbolic due to the assumption that it is 'embedded in social norms'. If

information is seen in this way, then differences in social norms may cause variations in the use of information and hence different treatments of information technology. Boland (1979, 1985) advocated a 'cultural approach to information systems requirements' as a consequence of considering information systems as comprising an 'environment of symbols' where 'sense-making' processes take place (Walsham & Waema, 1994, p.155).

Social norms, symbols, and sense-making are all concepts that are strongly related to the work on culture. If the theory relating to national culture is to be accepted, then the conclusions that Boland and Feldman & March make with respect to culture have serious implications. It is likely that information system use and development will vary according to differences in national culture. There are many others who relate information systems with culture (see for example, Robey and Markus, 1984; Hirschheim and Newman, 1991).

2.1 Hofstede's Dimensions

Hofstede's study of national culture is one of the most extensive and well known. There were approximately 120,000 respondents in over 40 countries. Hofstede's data was collected through questionnaires given to the employees of one multinational firm, IBM. Amongst others, Erez and Earley (1993) warn that there are flaws in Hofstede's data which should be interpreted with care.

There are several problems with the data which should be noted. The fact that all respondents were employees of a single large organization may confine the generalizability of the data. This is because IBM employees could be considered as

'unique'. The other side of this argument is that by confining the collection of data to one organization, a certain 'stability' may be achieved (Shackleton and Ali, 1990).

Whether we accept that Hofstede's data is robust or not, the fact that there are international variations in culture (somehow measured) is clearly demonstrated. Hofstede provides four valuable dimensions for discussing cultural differences. These are Power Distance (PDI), Individualism (IND), Masculinity (MAS), and Uncertainty Avoidance (UAI). Figure 2.1 below shows their definitions.

Hofstede's Dimensions of Culture

Power Distance

The extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed equally.

Individualism

Individualism pertains to societies in which the ties between individuals are loose: everyone is expected to look after himself or herself and his or her immediate family.

Masculinity

Masculinity pertains to societies in which gender roles are clearly distinct (i.e. men are supposed to be assertive, tough and focused on material success whereas women are supposed to be more modest, tender and concerned with the quality of life).

Uncertainty Avoidance

The extent to which the members of a culture feel threatened by uncertain or unknown situations.

Figure 2.1 : Definitions of Hofstede's Cultural Dimensions

Source : Hofstede (1991)

2.2 Hofstede and Greece

For the study of IT in Greece it is useful to look at Hofstede's findings. Table 2.1 shows Hofstede's data for the four cultural dimensions as measured for Greece. The data was collected for 50 countries and 3 regions; Greece's rank, score, and relation to the 'highest' and 'lowest' countries is shown. The scores for the USA and the Great Britain are also included for comparative purposes.

It is in the USA and Great Britain that most IT research has been conducted. The fact that these countries are similarly positioned along Hofstede's dimensions and the fact that countries such as Greece score considerably differently may have important implications for the study of IT in other, 'different', regions of the world. This,

together with the themes that emerge from the 'socio-positive' literatures (see, Chapter 1), presents a strong case for context-specific studies.

Hofstede's Data

	Country	*Rank*	*Score*
Power Distance			
	Malaysia	1	104
	Greece	27/28	60
	USA	38	40
	Great Britain	42/44	35
	Austria	53	11
Individualism			
	USA	1	91
	Great Britain	3	89
	Greece	30	35
	Guatemala	53	6
Masculinity			
	Japan	1	95
	Great Britain	9/10	66
	USA	15	62
	Greece	18	57
	Sweden	53	5
Uncertainty Avoidance			
	Greece	1	112
	USA	43	46
	Great Britain	47/48	35
	Singapore	53	8

Table 2.1 : Hofstede's Data : Greece, USA, Great Britain, and the 'extremes'.

Source : Hofstede (1991)

2.3 Cultural Implications

It is difficult to draw implications from this type of data if our intention is to make specific conclusions or accurate predictions. Hofstede's data is valuable however in that it indicates certain cultural tendencies or affinities toward particular work styles, organization methods, or relationship practices. It is not the aim of this study to propose hypotheses in advance of the data analysis, but a brief look at Hofstede's data

with some discussion of its implications for IT use and development, may be of some benefit.

2.3.1 Power Distance

On Hofstede's PDI scale, Greece ranks 27th/28th compared to 38th for the USA and 42nd/44th for Great Britain. This means that the Greeks perceive (and accept) greater inequality in power relations and the distribution of control than the Americans or the British. The implications this has for IT use and development could produce a lengthy discussion. Briefly however, it is likely that the Greeks will prefer and accept systems which reinforce power distances. For example, information systems based on centralised processing and storage of data, or communications designed around a central hub, are likely to be favoured.

2.3.2 Individualism

On Hofstede's IND scale, Greece ranks 30th compared to 1st for the USA and 3rd for Great Britain. This would suggest that the Greek people are much more 'collectivist' than the Americans or Britons. Greeks are likely to extend close relationships or concerns beyond themselves or their immediate family. In the Greek workplace it is likely that tasks are executed interactively - involving several people with much discussion and consultation - although the stronger PDI score may mean that 'the boss' makes the final decision.

A more collectivist culture such as that of that of Greece is likely to demand information systems that are linked together (networks). Systems where information can be shared amongst groups of people who work together are likely to be preferred. Multi-user systems such as those enabled with UNIX operating systems may be

successful. Such systems allow data to be *held* centrally (a strong PDI culture may prefer this), whilst at the same time permitting users to work on the same files simultaneously or access the same information - satisfying low IND cultures.

2.3.3 Masculinity

Greece, the USA, and Great Britain are similarly positioned on Hofstede's MAS scale. Masculinity is a concept that is more difficult to apply to the use and development of IT than Hofstede's other dimensions, and it has not been a concern of this study to look at gender roles or relationships in the workplace. Managers in Greece are usually men, the decision makers for IT development are also likely to be men, but the users of IT are likely to be of mixed sexes.

2.3.4 Uncertainty Avoidance

Greece ranks strongest (number 1) on Hofstede's UAI scale. This compares with 43rd position for the USA and 47/48th position for Great Britain. The *prima facie* implication is that Greeks feel considerably more threatened by uncertain or unknown situations than the Americans, and even more so when compared with the British (Rank comparison ; Greece 1, USA 43, Great Britain 47/48).

The possible connotation for IT use may be that Greeks prefer IT systems that help them *control* their environment. Systems that are predictable or that provide timely and comprehensive data may be more desirable. IT arrangements where the computer makes 'autonomous' decisions (e.g. neural networks) may take time to become culturally acceptable. The uncertainty that surrounds such systems may be seen as an unnecessary addition to the already strong UAI tendency.

2.4 Hall & Hall's Dimensions

Hall & Hall (1989) provide another cultural study which aims to integrate the study of underlying patterns of behaviour to show the critical relationships between different parts of culture. Their main aim was to "maximize success" for American executives who wish to 'understand' the French and Germans. Hall & Hall provide seven dimensions along which cultures may differ. These are (1) speed of messages, (2) context, (3) space, (4) time, (5) information flow, (6) action chains, and (7) interfacing. Of these, context and time are important cultural differentiators, particularly when we wish to explore information related concepts.

2.4.1 Context

Context refers to the 'information that surrounds an event'. When a message is communicated (between people or from machine to person), the amount of detail that accompanies the message will determine the effectiveness of the 'transmission' and will depend on the recipient requiring a 'high context' or 'low context' message. A high context message is one in which the detail is assumed (conventional) or can be considered as part of the 'context'. According to Hall & Hall, "Japanese, Arabs, and Mediterranean peoples, who have extensive information networks among family, friends, colleagues, and clients and who are involved in close personal relationships, are high-context" (p.6).

The mode and style of communication that is 'assisted' by IT is likely to be affected by the positioning of a culture along the high to low context scale. High context cultures, possibly the Greeks, may not find it easy to codify a message for transmission using language only (e.g. electronic mail) – effective communication may require other contextual manifestations such as facial expressions, tone of voice, or hand gestures.

People from high context cultures may prefer to use computer assisted electronic communication for only certain types of messages, for example, those which do not involve a response or decision, such as a report of data.

2.4.2 Time

The second important dimension is time. Hall & Hall distinguish cultures by classifying the way people work, the number of tasks that are executed at the same time, as being either 'Monochronic' or 'Polychronic'. Monochronic time is where people in a culture can pay attention to and do only one thing at a time. Polychronic time is where people involve themselves with many things at once.

2.4.2.1 Monochronic Time

Monochronic cultures are those where people prefer to use time linearly. Events are enacted sequentially and information is processed serially. People who work in this way dislike interruptions and organise their 'schedules' to avoid unpredicted breaks. Monochronic time separates people and seems to foster 'individualism'.

It is interesting to make a link here between Hofstede's study and Hall & Hall's. Monochronic time culture encourages individualism. In Hofstede's study, the USA ranked number 1, most individualistic, with an IND score of 91. Hall & Hall come to a similar conclusion and note that "Monochronic time dominates most business in the United States. Americans perceive it as almost in the air they breathe" (Hall & Hall, 1989, p.14).

2.4.2.2 Polychronic Time

People in Polychronic cultures work simultaneously with many tasks and do this with a high degree of inter-personal involvement. Polychronic people thrive on information and need to be well informed about everything and everybody, business or personal. The Greeks are likely to be Polychronic. Their working environments are often full of interruptions - telephones ring constantly, people come and go, the environment is noisy. The aim in a Polychronic culture is 'task completion' — without the need to observe temporal constraints (e.g. timetables or schedules).

2.5 Culture and the Management of IT

There is a multitude of cultural definitions. To define culture precisely is thus difficult. There are however some recurring themes that emerge from most of the definitions. Values and behaviour are key concepts. It is likely that the way people do business varies from country to country, affected by differences in values and behaviour. With the globalisation of markets and the growth of international operations, international IT strategies have become necessary. Problems may arise if IT strategies are 'transplanted' across national boundaries. Tan et. al. (1995) argue that existing IS theories and research findings need to be examined to assess their cultural robustness. In the light of cultural studies such as Hofstede's (1991) and Hall & Hall's (1989), Tan et. al. that recommend IS researchers address a fundamental issue, "can knowledge grounded in North American culture be applied in other cultures?" (Tan et al, 1995, p.82).

The aim of this study (IT in Greece) is to explore the interpretations of information technology in organizational settings. This is important for those interested in the effective implementation and use of technology. As Sahay et al (1994) point out,

"most technological research honours the material operating properties of information technology, subjective interpretations can drastically affect the success or failure of implementation efforts" (p.257). What is needed is an exploration of the 'social construction of technology' (as affected by culture) to augment what is known about the objective characteristics of technology.

The core issue, as argued by Bell (1994), "is that of context and, crucially, the meaningful understanding of the requirements of context in which technology is being placed" (p.324). The significance of culture and its ramifications is summed up in the following; "...it is essential to recognize that technology comes with cultural packaging" (ibid, p.325).

Chapter Three
Research Methodology and Context

3.1 Purpose

Chapters one and two have set the backdrop to this study. The aim of the preceding chapters was not to provide solutions but to identify problems, and more specifically, to provide the rationale for conducting research such as this. The pivotal assumption is that the works outlined previously (social constructivism, culturalism etc.) may be accepted as a starting base.

If we were to begin with assumptions such as those of the Aston Studies (Pugh and Hickson, 1976), which aimed to support a *culture-free* thesis, then there is little value in conducting a study such as this – which lays explanation in (and assumes there to be) contextual variations. By accepting this latter assumption, the aim is not to prove that variations exist, but to illustrate them and highlight their consequences. This study of the development and use of Information Technology in Greece has aimed to be exploratory. The severe lack of literature dealing with regions of the world such as Greece provides the need for descriptive research. The aim has been to equip future researchers with an understanding of the context and its peculiarities. There is a need to 'think differently' as argued by Bell (1994) – "The reality of the developing country context is that methods are being exported and that these methods are, by and large, limited to a western cultural scientific tradition" (p.334).

3.2 Methodological Problems

There are many methodological problems with exploratory research of this kind. The approach taken is interpretive or grounded. The intention has been to try to allow the

respondents to describe their *own* context and to endeavour to capture a description of the world as they see it.

Where an emphasis is placed in cultural explanation, Hall & Hall (1989) argue that there are two particular problems. Firstly it must be recognised that the researcher is conditioned by the implicit perceptions of his or her own culture. It is hoped that some degree of 'constraint' has been removed from the study by not specifying hypotheses at the outset. The responses need to be interpreted with care to avoid any endo-cultural bias of the researcher. To some extent this is unavoidable. The second methodological problem argued by Hall & Hall relates to the theories, assumptions, and hypotheses, that the researcher may take for granted (implicitly). These may create barriers between the observer and the culture being studied.

Bell (1994) reinforces this latter point in the following; "...evidence suggested by authors such as Checkland (1981) and Bell and Wood-Harper (1992) [shows] that some methodologies can be severely restricting and limiting when applied in contexts for which they were not originally intended" (p.324).

3.3 Methodological Strategy

Given the general aims of this research, to be exploratory, not to pre-define hypotheses, and to allow the respondents to describe their own context, the most appropriate methodological approach is interpretive. It is not necessary to enter into a long analysis of the benefits, problems and differences of various methodological approaches, because given the assumptions of this study as outlined in the above, most other approaches would not be suitable. A positivist process of inquiry is that which I wish to avoid. The epistemology that underlies positivism is precisely that

which has led to the exclusion of valuable alternative ways of thinking. In contrast to positivist methods, relativist or interpretive methods emphasise greater sensitivity to the context within which social phenomena are manifested and interpreted.

Greece has been chosen as the focus for this research for several reasons, many of them practical. The choice of Greece was influenced by my own experience of information technology in Cyprus – (which inspired this research) my ability to understand Greek, and the proximity and relative accessibility of Greece to the UK.

In essence, Greece is being used as a single case study. If time and other resources permitted, it may have been valuable to conduct similar inquiries in other less developed European countries (such as Portugal and Spain). Smith (1989, in Walsham, 1993) discusses the use of single case studies as bases for drawing inferences about a particular area of study — they relate to an interpretive epistemological stance. He argued that, from an interpretive position, the validity of an extrapolation from one or more individual cases depends not on the representativeness of such cases in a statistical sense, but on the plausibility and insight of the logical reasoning used in describing results from the case, and in drawing inferences and conclusions from those results.

Sahay et al's (1994) methodological approach, which relates directly to information technology, is one which is useful to apply. By assuming that the "implementation and use of information technology are not objective phenomena with known properties or dimensions" (p.248, emphasis added), methodology needs to be "consistent with the epistemological assumption that reality is subjective, that is, best understood in terms of actors' subjective meanings rather than the researcher's objective definitions" (ibid).

With a specific interest in the social context of what is being studied, and by taking an interpretive viewpoint, the research approach used here could best be described as inductive. As explained by Sahay et al, with an inductive process the researcher is concerned with generating evidence which can then become the basis for producing theoretical statements. This is different to positivist methods which are deductive. Deductive methods begin with hypothetical statements that are subject to empirical testing. Sahay et al argue that "the use of an inductive approach is appropriate when studying information technology from a relativist perspective" (p.251).

3.4 Research History

This study of the use and development of IT in Greece started out as part of a larger research project which aimed to look at IT in less developed regions of the world. Greece was chosen as a starting point, for practical reasons, and as a fairly good representative of a nation which has a less developed IT base within the European Community (EC).

The initial plan was to begin with a postal questionnaire and to follow this up with a series of interviews. Future stages in the research would have aimed to repeat the study in other countries – probably less developed EC states. Due to a lack of resources, the current study has only gone as far as completing the initial questionnaire stage for Greece. However, the data that has been gathered is significant in relation to the total research effort in the same field, and so it has been decided that the results are adequate for analysis in the current thesis.

3.5 Research Context

As mentioned above, the results of this study are significant when compared with the total research effort in the same field so far. There has been little research on Information Technology in Greece that has been concerned with exploring 'soft' or organizational issues (those which may determine its success or failure). Much of the research in Greece that explores the IT field is in the 'harder', technically related fields such as computer science. Most of the 'soft' research that has taken place has been published by Professor Doukidis (often et al) of the AUEB and is thus relatively easy to locate.

A large proportion of the research published on IT in Greece has been concerned with Electronic Data Interchange (EDI) – (see, for example, Doukidis 1993; Doukidis and Fragopoulou, 1994) . This research, as most IT research in Greece, is still in its very early stages. Both the general research effort and interest in these areas are minimal in Greece as compared to other EC member states. The following chart (figure 3.1) shows how Government support for research efforts in Greece has been at a minimum as compared with other EC member states:

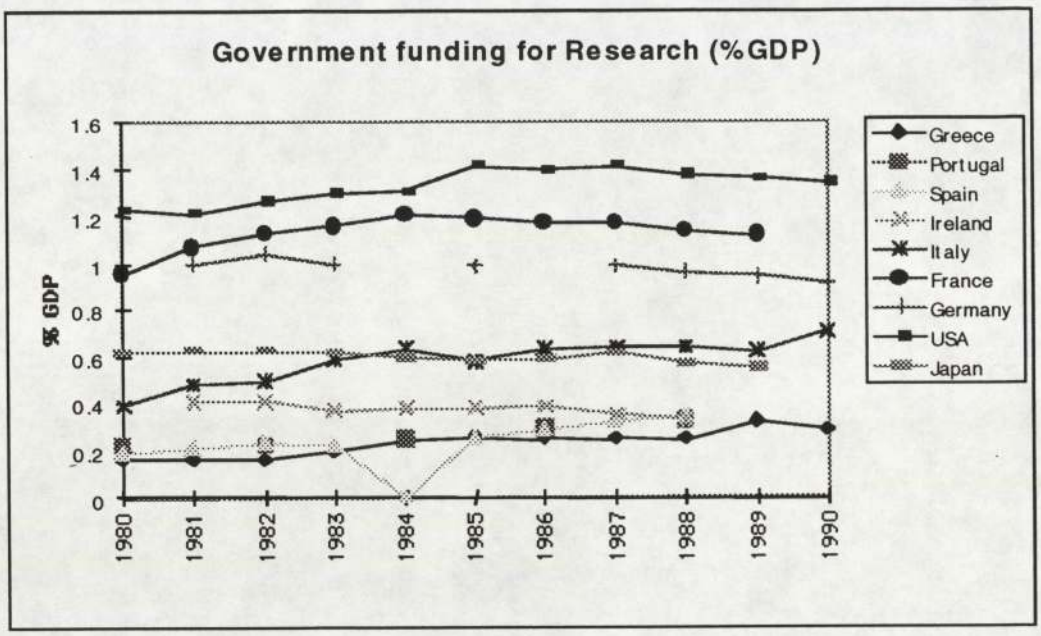

Figure 3.1 : Government Research Funding Data

Data Source : Research and Technology in Greece : Thesis - Perspectives, Pasok 1993, p.225.

As the Greek economy is dominated by small firms, it is unlikely that private research efforts are significant because of the high costs normally involved. Thus, the general level of research effort in Greece is most likely to be low.

3.5.1 Greek Socio-economics

One of the dominant characteristics of the Greek economy is the large size of the public sector. There has been rapid expansion of the Greek public sector over the last thirty years, both in terms of the size of existing 'departments' and the number of areas of economic activity that it involves. The cumbersome and bureaucratic public sector is often considered to be a provider of low quality goods and services and to have excessively high operational costs (Constantelou, 1993). One of the results of

maintaining a large public sector has been to cause an enormous public sector deficit. This has served to limit Government's flexibility in policy-making because of its preoccupation with trying to reduce the debt. There is a large 'black economy' and a high rate of tax evasion. These factors play a major role in preventing improvements in the public deficit.

The structure of the economy in terms of firm size is also unusual. Ninety-nine per cent of firms in Greece are 'small' (less than 50 employees) (Doukidis & Smithson, 1995). The population consists of a large number of aged and unskilled people which places strains on the labour markets. The ageing population further aggravates the public debt by placing pressure on the social security system. Much of industry is located in the Athens area and there is another concentration in the Thessaloniki area. Infrastructure has tended also to be concentrated in these areas and firms which exist in the more remote parts experience many problems with the lack of support and services. Greece became an EC (EEC) member in 1981 and has had continual support through various funds programmes.

3.6 Previous Research

There are two very important studies which are concerned with researching IT in Greece. By looking at the data from these studies, and the results of the current thesis, a more up-to-date picture of IT in Greece can hopefully be achieved.

The earlier paper by Smithson et al (1990) (see also, Doukidis and Smithson, 1995, pp. 75-100) describes a study of IT in Greece which involved 194 respondents. The data which is analysed is drawn from studies in 1986 and 1989, (with predictions for 1992). A latter study by Doukidis et al (1994) attempts to draw trends in IT development and use by comparing 1984 and 1989 data.

Smithson et. al.'s (1990) study had initially aimed to look at advanced manufacturing technologies (AMT) but it was decided to look at the general usage of IT because it had been realised that AMT was little used and the results would be of limited value. The study involved a questionnaire survey and looked at the following main areas:

- what IT was being used for
- how it was being applied

and

- how satisfied companies were with its use.

The main findings are summarised in table 3.1 below. These findings will be returned to when analysing the data in chapter four.

- Greek manufacturers are at the start of automation curve
- More than 75% of firms surveyed use IT
- IT use is mainly administrative
- little 'end-user' activity
- little use of IT by 'management'
- large firms more likely to use IT
- large firms more likely to have DP department
- difficulties with suppliers (expressed by small firms)

Table 3.1 : Main conclusions from Smithson et al's (1990) study.

The other main study which was conducted by Doukidis et.al (1994) (see also, Doukidis and Smithson, 1995, pp. 118-142) involved the use of semi-structured interviews based on a questionnaire which was similar to a previous survey. The questionnaire consisted of both open and closed questions and issues which were included are:

- previous experience with IT
- factors influencing the decision to adopt IT
- advice obtained
- training issues

and

- problems encountered in implementation and solutions.

The main findings of the Doukidis et al (1994) study are summarised in table 3.2 below:

- increased experience and awareness of IT amongst small firms
- increased use of feasibility studies
- importance of software houses (advice/training)
- small firms have little regard for IT planning
- dissatisfaction with vendor training

Table 3.2 : Main conclusions from the Doukidis et al (1994) study.

3.7 Questionnaire

In this research a questionnaire was used to gather data to explore the development and use of IT in Greece. It had been initially designed in English (cf. Appendix 3) and later translated to Greek. There were problems in the translation process as some concepts did not make sense in Greek. Experts were consulted and lengthy discussions entered into in order to make the translated version as 'acceptable' as possible and to avoid unnecessary error.

The questionnaire had been designed to be practical in both a theoretical and a pragmatic sense. In terms of pragmatics, the questionnaire was designed to be clear to read and easy to fill in. There were physical constraints that needed to be accounted for such as the weight of the questionnaire. This needed to be kept below 50 grams so as to be accepted by the post office in an international pre-paid envelope.

In terms of the questionnaire's theoretical design there were several important issues that were considered. The previous studies in the same field were looked at (cf. Section 3.6) in order to influence the choice of questions. This was done so that some degree of comparability could be achieved. The original intention had been to target various industrial sectors (food, textiles, wood, etc.) by coding the questionnaires using different coloured paper. This was made impossible when PRAXI/SEV took control of the distribution. The value in doing this (at this level of analysis) would have been limited and compared with the extra analytical effort that would be involved – not worthwhile.

As the questionnaire had not originally been intended to be the central research vehicle for this study, only rudimentary consideration to methodology was given. However, some attempt was made to avoid the use of leading questions, to avoid errors of central tendency, and to provide some open ended questions which could be used for further interpretive analysis. Some of the questions were intended only to provide reference information and to help in compiling trends by comparison with previous studies. Several of these, more specifically the limited-response questions, may not be entirely congruent with an interpretive style. The asking of such questions may not be problematic per se, but the serious problems may arise with the analysis of the responses to such questions. The respondents' 'natural' response may not have been included in the 'limited-responses'. Problems may arise because of the possibility that such questions may have 'led' the respondent to the response given. It had been hoped that future stages of the research (triangulation) may have helped to qualify many of these responses.

The questionnaire consisted of approximately thirty questions. There were four sections which covered the following areas:

(1) The company and the respondent

(2) Technological Systems

(3) System Development

and (4) System Use.

The wording of some of the questions was left 'intentionally vague'. For example the section entitled 'Technological Systems' consisted of questions such as "Which technological systems are there in the firm?". It was hoped that by not being too specific with questions, (for example, "Do you use computers?" or "Do you have a photocopier?") the respondent was given the opportunity to interpret his or her context in the way that he or she perceived it – and not in ways directed by the researcher.

With the help of SEV (Association of Greek Manufacturers) in Athens, the questionnaire was posted to one thousand Greek firms involved in light manufacture. This was done through a branch of the Greek Chamber of Commerce (PRAXI). The members of PRAXI received the questionnaire together with a covering letter which included the logo of the Athens University of Economics and Business (ASOEE). This was arranged with the kind help of Professor Georgios Doukidis with the aim of increasing the response rate.

Unfortunately, due to various communicative problems, the questionnaire was not mailed to firms until the end of July. This was not a particularly favourable time for a postal survey because many small firms in Greece close during the month of August

for summer holidays. Despite this, the response rate was reasonable. Eighty three questionnaires were received, excluding those which were not adequately completed, making a response rate of 8.3 per cent.

Smithson et al's (1990) study which looked at the use of IS in the manufacturing sector was similar. The initial stage was a postal questionnaire to 1200 firms. The response rate was approximately 16 per cent, but of these 22 per cent did not report any use of IT. It is possible that the wording of the current questionnaire was such that only users of IT felt that they were able to respond, thus those who felt that their response would not be valuable (i.e. 'we do not use IT') did not reply, hence the lower response rate. All of the respondents in the current study use IT in one form or another.

There was little that could be done in order to improve the response rate. Since PRAXI/SEV handled the distribution of the questionnaires in order to maintain confidentiality of their membership list, the use of follow-up telephone calls to those who had not responded was impossible.

4.0 Data Analysis

The objective of this research is to build a picture of technology use in Greece so that further research in the field can be better informed and assumptions may be more accurately qualified. The analysis of the data as well as the type of data collected is conducive to this objective. Both quantitative and qualitative data has been collected. It is hoped that the data sets can complement each other in the analysis. In the following sections, the pragmatics of the collection of the data and the findings for each section of the questionnaire will be discussed. At the end of the analysis, comparisons with Smithson et al's (1990) study will be made, together with an attempt to determine IT trends in Greece.

4.1 Sample

Section 1.4.1 discussed Bijker et al's (1987, 1989) Social Construction of Technology theory. In taking a relativist standpoint, where it is expected that culture, or more specifically, the unique attribution of meaning, may play an important role in the utilisation of technology – such concepts are of benefit. With respect to what may traditionally (in positivist studies) be referred to as 'the sample', the concept of 'relevant social groups' (RSG) is a suitable analogy and is adopted here.

The RSG can be seen as a group who influence the creation, demand, production, diffusion, acceptance, or opposition to the technology. The RSG is used to depict 'institutions and organizations, as well as organised or unorganised groups of individuals'. The respondents to the questionnaire in this research could be seen as one such RSG. The respondents are a group insofar as they are all involved with light

manufacture, are all members of a particular chamber of commerce (SEV/PRAXI), and all have experience of implementing or operating (interacting with) IT to support their businesses in some way or another.

As previously shown in figure 1.1, for any particular technology there may be several RSG's. The assumption here is that the respondents to the questionnaire are one such group as shown in the diagram below.

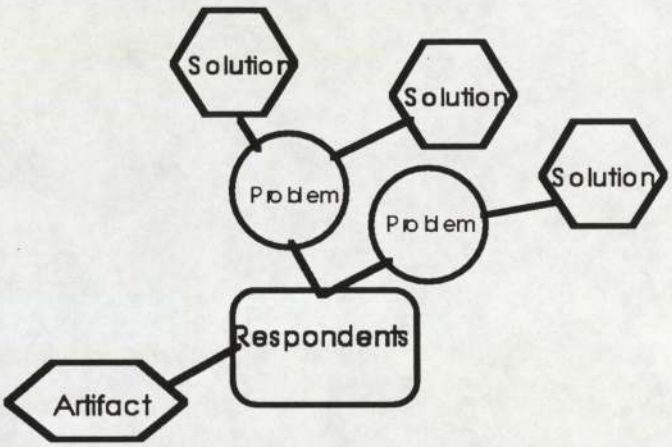

Figure 4.1 : One relevant social group.

With the analysis of data that follows, this group can be seen as perceiving various problems with the technology and may also consider or have considered some solution(s) to these problems. The questionnaire aims to explore some of these issues. With the concept of RSG's, the main interest is in the (perceived) problems that any particular group encounters with the technology. These may differ depending on the meanings that groups construct for a technology. The RSG concept was originally intended for the analysis of a single technological artefact (hence 'artefact' is at the centre). In this case, 'artefact' refers to IT in general, and the questionnaire aims to

explore the meanings that respondents attribute to IT – i.e. what exactly is IT considered to be and what problems/solutions arise.

Defining a group that is 'sufficiently homogeneous' so that it may be considered to be an RSG is problematic (cf. Section 1.2). In this case the assumption is that the respondents can be grouped as an RSG based on similarities in business activity (manufacturing), education (degree level), and organisational position/role (management). It is hoped that by defining the RSG in this way, the respondents are likely to have met many of the same problems and solutions with respect to similar technologies.

4.2 Reason for Choosing Sample

Whilst the intention of this study is to create a 'picture' of technology use, the approach taken, together with its assumptions, mean that focusing on one RSG is necessary. This is because in order to build an explanation of technology's use inductively, respondents need to be chosen who can meet this objective. This is different from a positivist effort to generalise about population characteristics from a typical random sample.

There were of course practical reasons why this sample was chosen. The SEV chamber of commerce was not willing to disclose its membership list and provided access to one thousand firms on the PRAXI list by handling the distribution. The questionnaires were pre-packaged in the UK and shipped to SEV in bulk. This was favoured as the response rate may have been influenced by the fact that PRAXI added their own covering letter and posted the questionnaires from Athens, thus providing a Greek postal mark. It was also sensible to 'target' manufacturing firms so that some

comparison with previous studies could be made — in this case the most appropriate (and extensive) is Smithson et al's (1990) work [this will be referred to as the S90 study].

4.3 Data Collection

The data collection process via the questionnaire was intended to be anonymous. This was done in order to hopefully improve the response rate as it was assumed that answers to some of the questions may have required information that could be considered sensitive or confidential. Accompanying the questionnaire was a separate sheet for respondents to request copies of the results. As most respondents returned this, it was possible to get some idea of the location pattern of the respondents. Table 4.1 below summarises this information:

Response by location (n=74)

	frequency	*% of respondents*
Others	35	47%
Athens	21	28%
Larissa	10	14%
Thessaloniki	8	11%

Table 4.1 : Location of respondents

It is interesting to draw a comparison with the S90 data. In the S90 data the largest proportion of respondents were from Athens (56%) and the second largest from Thessaloniki (17%). This may have led to the conclusion that most IT use is in and around the Athens area (Attiki). The data collected here removes the emphasis from Athens and provides information on many other areas. This may be reflected later in

the analysis of 'problems encountered' which are likely to be related to infrastructure or associated with supply or support.

It is also interesting to see a 'cluster' of responses from the Larissa area. Given that the distribution was handled by PRAXI, there is little that can be deduced from this fact, except that a significant portion of the information collected is about an area other than Athens.

4.4 Questionnaire Section One : The company and the respondent

4.4.1 Size

The first question attempted to ascertain the size of companies by asking for the number of employees who work in the firm. The following table shows the distribution of companies by size.

Response by number of employees (n=83)

	frequency	*% of respondents*
<51	58	70%
>50	25	30%

Table 4.2 : Size of companies

After 1984 the threshold in terms of number of employees for a Greek company to be considered small or large was 100 (Doukidis and Smithson, 1995, p.120). Before this, a company that had up to 50 employees was considered a small business (SB). The fact that around 99 per cent of companies in Greece employ less than 50 people would indicate that for analytical reasons, the 50 person definition is adequate. Table 4.2 shows that the majority of respondents fall into this category.

If it is believed that the size of a company plays an important role in the development, use, management, implementation, and organization of technology; then knowing the size distribution of companies in Greece (99% SB's) and that most IS and IT research has concentrated on large (often multinational) firms (eg. Earl's, 1989) – provides good reason for research such as this. Rothwell and Zegveld (1982) have placed great emphasis in size as a causal factor by conducting extensive research which associates size with differences in innovation patterns and characteristics.

4.4.2 Company Nationality

Data was collected to determine the nationality of the respondent companies. This was done in order to try to trace incidents of technology transfer from abroad. The following table is a summary of the results of response by company nationality.

Response by company nationality (n=83)

	frequency	*% of respondents*
Greek	81	98%
Foreign	2	2%

Table 4.3 : Company nationality

The two foreign companies to respond both employed over 100 people. One was American and the other Dutch. One of the firms mentioned the use of a wide area network (WAN) to connect to other towns. The other used large-scale multi-user (UNIX-based) technology. The larger of the two firms used electronic mail (e-mail) for most of its intra-firm communications. In relation to the other respondents, the technology used by these firms appears to be advanced and it is likely that the foreign owned parent companies are responsible for some transfer to Greece. The responses

of these firms to the question of how they perceive their use of IT in relation to other firms is interesting. One of the responses was 'superior' and the other 'inferior'. The responses of the other firms to this question will be analysed in section 4.7.4 below.

4.4.3 Subsidiaries and Branches

The respondents were asked to provide information on the structure of their firms. The numbers of firms who have subsidiaries or branches (in each size category and as a total) is shown in table 4.4 below.

Numbers of subsidiaries or branches (n=83)

size	*frequency*	*% of size category*
<50	16	28%
>51	16	64%
all	32	39%

Table 4.4 : Subsidiaries and Branches.

The companies with subsidiaries or branches may require links with head offices or WAN's for intra-firm communications. The total proportion of respondents with subsidiaries or branches is 39 per cent. These may have a greater need for 'external use' IT and may express particular problems with such configurations in the following sections.

4.4.4 Respondent's Position and Company Information

Background information was obtained on the respondent's position within the firm (as a guide to his or her duties and responsibilities), education, and length of employment. This information is important because it may be related to position in social networks

or membership in relevant social groups. For example, members who share the same educational background may approach technological issues in similar ways.

Nearly all respondents were from managerial ranks. Only 10 per cent were not. These were accountants, consultants, IT employees and research staff. Given that nearly all the respondents held similar positions in their firms, it is probable that they also share similar goals and have experienced many of the same types of organizational problems. The educational background of the respondents seems to be similar or at least to similar standards. This is shown in table 4.5 which shows how many respondents hold university degrees.

Respondent's education (n=83)

	frequency	*% of size category*
degree	76	92%
no degree	7	8%

Table 4.5 : Education of respondents.

Assuming that the respondents are 'educated managers' (as a generalisation) we can begin to define the respondent RSG. This is useful so that the problems or solutions that are identified can be attributed to a specific RSG.

Information was also obtained on respondent's length of service with companies. The average length of service is 7.3 years. To complement this information, the age of each company was also ascertained. The average company age is 20.2 years. There were a few 'old' companies, including one that was 115 years old —these pushed up the average. A better understanding of the ages of the respondent companies may be

gained by looking at a plot of the cumulative frequency distribution. The distribution of company age is shown in figure 4.2 below.

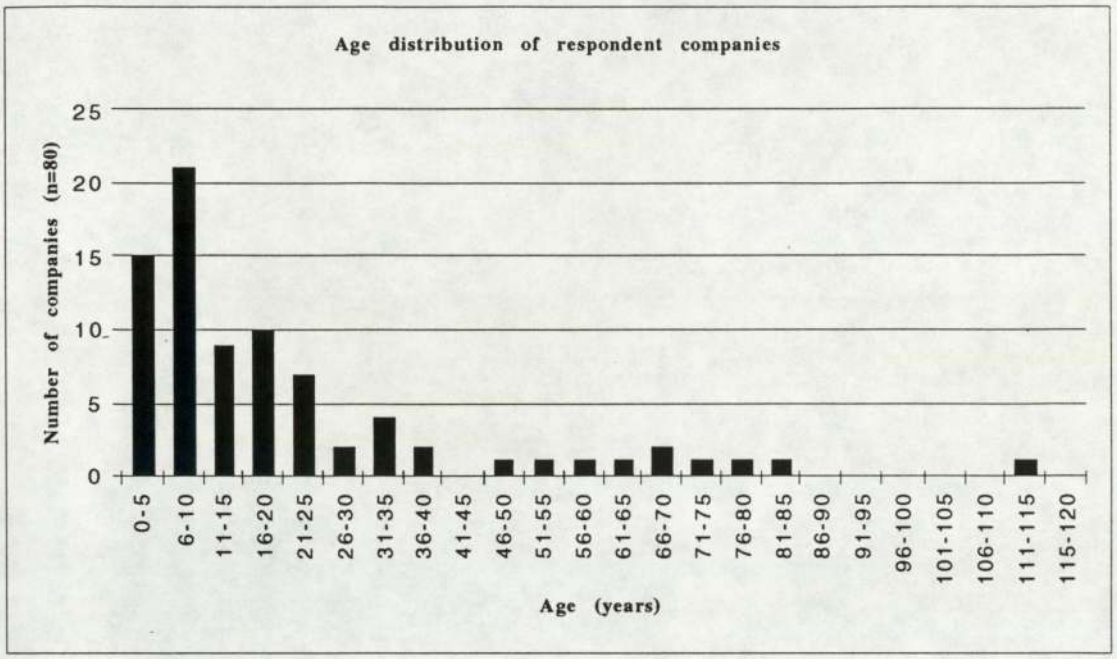

Figure 4.2 : Age distribution of companies.

The mode is 4 years and accounts for 14 per cent of the response. Most of the firms are in the <22 years old range (77.5 per cent). The age of the company is likely to influence the use of IT as well as employees' length of experience with technology. This may be shown as differences in the perceived problems and solutions each faces.

4.5 Questionnaire Section Two : Technological Systems

The second section of the questionnaire aimed to obtain information about technology use – what technology is being used, when it was acquired, and where it is being used. An attempt was made to distinguish between technology for 'internal' use and that which assisted 'external' operations or tasks. The problems and issues that arise with technology that is dedicated for external use may be different to those experienced

with internal use technology as it is often the case that intermediary organizations are involved. These may produce their own problems and such organizations could include telecommunication companies, power supply firms, Value Added Network (VAN) vendors, and the like. Similarly, problems can arise with the various information sources or destinations (those who are linked). With even simple technological links for example, standards must be agreed between the communicating parties, in order for the communication to be successful. Agreement between any of the third parties mentioned here, or any others, can not be assumed.

4.5.1 Interpretation of Context

The first question in this section asked "Which technological systems exist in the company?". This was left ambiguous in order to allow the respondent to provide an interpretation of his or her own technological context. By asking specific questions such as "Do you use a photocopier?" the responses would be constrained to what the researcher interprets as being 'technology'. This would not allow the respondent to demonstrate what they consider as important in their own context.

In section 1.4.1 SCOT was discussed. One of the central concepts of SCOT is 'interpretive flexibility'. It is believed that the *differences in the meanings* people attach to a particular technology are likely to affect its success. Similarly, (and perhaps prior to this) the differences in what is *considered* to be technology may also have implications for technology implementation. Some cultures may never consider the use of a particular technology if it can not be integrated with their ways of working or social construction of reality. This can vary from context to context and is associated with the main assumption in adopting a SCOT perspective – that 'knowledge' is socially constructed; produced through social processes.

A good example is provided by Podder (1988); "...a perfect working model of a steam engine existed in the famous library of Alexandria and the ancient Greeks invented a mechanically sound steam turbine, yet the ancient world could not think of their utilization in productive activities. The reason for this must be that the ancient world did not feel the social necessity for the power of the steam engine".

4.5.1.1 Keyword Analysis

The results of the first question in this section produced a large quantity of qualitative data. Appendix One shows the keywords that have been extracted from the responses, and the number of occurrences of each. There are nearly 100 different keywords. The table in Appendix One has been sorted alphabetically for analytical convenience. The keywords which occurred at least 5 times are summarised in table 4.6 below.

Technological keyword/phrase	*Occurrences*
PC	42
Novell Network	23
Network	15
Modem	13
UNIX	13
Accounts Software	14
Fax	11
Windows Network	11
Laser Printer	9
LAN	8
Servers	8
Telephone Network	8
Windows	8
DOS	7
Database	7
IBM AS400	7
Scanner	7
Macintosh	6
Photocopier	6
Terminals	5
CAD	5
Dot Matrix Printer	5
Computers	5
Plotter	5

Table 4.6 : Technological Keywords occurring at least 5 times.

PC's are the most frequently mentioned technological system and account for 11 per cent of all responses. Around half the number of respondents identified the PC as a technological system in their context. To this can be added approximately 7 per cent in response for Macintosh computers, computers in general, servers, etc. In fact, nearly

all respondents identified some form of computer processing as a technological system, the main differences being in the description of each particular system (make/model etc.).

Apart from 'Telephone Networks' and 'Photocopiers', the most frequently occurring technological keyword responses can be grouped into one of the following categories:

- Communications Devices
- Computer Processors
- Input Devices
- Operating Systems
- Output Devices

and

- Software.

These are typical IT tools and can be found operating in virtually all parts of the world today. These results are not surprising. What is not shown from this information is how the IT is being used and for what.

What is of particular interest is not so much what is used, but what technology is not used, or what is used by only a few firms. The table below summarises some of the least frequently occurring keywords.

Technological keyword/phrase	***Occurrences***
EDI	1
E-Mail	3
Stock Control	4

Table 4.7 : Some least frequently occurring keywords.

One of these, EDI, is a worrying response. There has been an extensive research effort in Greece on the use of EDI (see for example, Doukidis, 1993; Doukidis and Fragopoulou, 1994). In addition to this there is an EDI Awareness centre (EDIGRAC) in Athens which aims to promote EDI activity in Greece. The EDI research has so far shown that EDI use is in its very early stages in Greece. The single occurrence of the use of 'EDI' as a keyword would indicate that little has changed. Doukidis and Fragopoulou (1994) suggest that Greek firms have limited opportunities for adopting EDI because of the poor telecommunications infrastructure, the small size of most Greek enterprises, and the lack of sufficient EDI services. By 1996 there is still a lack of EDI services and this is preventing firms from using this technology.

4.5.2 System Installation

Respondents were asked to provide information to indicate when the technological systems that they identified were installed. The response choices were 1) in the last 5 years, 2) 5 - 10 years ago, 3) more than 10 years ago, or 4) other. Table 4.8 summarises the results.

System Installation (n=80)

	frequency	*% of respondents*
in the last 5 years	52	65%
5-10 years ago	17	21%
more than 10 years ago	11	14%

Table 4.8 : When systems were installed.

The majority of firms installed their technology in the last five years. This result should however be treated with caution. Several of the firms that are included in the respondent set were also founded in the last five years. By looking at diagram 4.2

(Age distribution of companies), it can be seen that approximately 19 per cent of companies were founded recently. This still leaves a 46 per cent band of companies who are relatively old but did not install their technology until recently. There could be many reasons for this. What is shown however is that IT use in Greece is in its very early stages and subsequently the experience of both firms and vendors in the field is likely to be limited – particularly as compared with nations who have been using and developing IT for many years (e.g. UK, USA, Germany etc.).

4.5.3 Departments Using IT

The questions which were designed to collect data on where within firms the IT was being applied did not seem to yield very useful information. It may be the case that questionnaires are not the best way to collect this type of information or that the questions were structured inappropriately.

Many companies responded that all their IT is employed within all their departments. Others listed the various standard business departments. High on the list of occurrences of departments was the accounts department. Other frequently mentioned departments were production, sales, marketing, and administration. Management were shown as users of IT in 24 per cent of the respondent companies. In Doukidis and Smithson (1995), management, as a staff group, were found to use IT in 20 per cent of cases. It would appear that there has been a slight increase in management use of IT, as may be expected, but it is difficult to draw definite conclusions as the differences in the data sets have not been controlled for.

4.6 Questionnaire Section Three : System Development

The third section of the questionnaire explored the existence of Information Systems departments. Where a company operated without an IS department respondents were asked to explain who was responsible for IT development within the firm. Table 4.9 shows the proportion of respondent firms with and without a separate IS department.

Existence of Separate IS Department (n=83)

	frequency	*% of respondents*
no IS department	46	55%
IS department	37	45%

Table 4.9 : Existence of separate IS department.

Given the generally small size of the respondent companies, it is surprising to see that more than half said that they did have a separate IS department. The size distribution of firms both with and without an IS department is similar. It is therefore not possible to come to the conclusion that the firms without a separate IS department are the smaller ones. The following two sections explore those firms who have an IS department and section 4.6.2 examines those without.

4.6.1 Information Systems Department

4.6.1.1 IS Department Rationale

The respondents who stated that they have a separate IS department for the development of their IT were also asked to comment on the reasons why IS was dealt with internally. The respondents were given five response choices and could indicate as many as they felt applied. The responses choices were 1) for economic reasons, 2)

for strategic reasons, 3) for improved quality, 4) lack of external know-how, and 5) other. The results are as follows:

IS Department Rationale (n=37)

	frequency	*% of respondents*
strategic reasons	30	81%
improved quality	28	76%
economic reasons	13	35%
other	13	35%
lack of external know-how	9	24%

Table 4.10 : Reasons for having an IS department

The highest ranking response is 'strategic reasons' (81 per cent). This may be due to the fact that many firms have identified problems with suppliers and vendors. One of the prime concerns has been after-sales service and particularly the time taken by suppliers to respond when problems occur. By organising IT development internally some of these problems can be eliminated.

Improved quality ranked second (76 per cent). Exactly what respondents were thinking when they chose this option is difficult to ascertain. Improved quality of operations, improved customer service quality, improved product quality are amongst a few of the meanings that could have been attached. Regardless of the specific meaning that respondents intended, the result indicates a general feeling that IT is perceived as having positive effects along perhaps less tangible dimensions.

The problem at this stage in the research in 'interpreting' responses is that there is a lack of 'triangulation'. There is no method of determining whether respondents are replying with what they believe the researcher expects to read or if they are trying to convey a positive image of their organisation. Interviews and observation, which

would have formed a later stage of the research had it continued, would have helped to qualify these responses.

4.6.1.2 IS Department Staffing

The size of IT departments was also explored. This was measured in terms of number of employees. Other measures could have been used such as allocation of internal resources but 'number of people' was chosen for simplicity. The average size of the IS department in the 37 respondent firms was 7.8 persons. This is a larger than expected figure. A closer look at the data shows that 19 per cent of these firms had an IS department that consisted of 10 or more employees, the largest being 40.

The size of a department is not an extremely useful statistic in itself but acts as a guide to the level of IT activity that is kept internal to organizations. Size data is more useful when expressed as a proportion of the total size of the firm. Figure 4.2.1 below shows a cumulative frequency distribution of the size of IS departments as a proportion of total firm size in terms of the relative numbers of staff members in the IS department and entire firm respectively. In most firms (19 cases), the IS department is represented by up to 10 per cent of the total number of employees.

Figure 4.2.1 : IS department sizes as a proportion of total size

Even then, for meaningful comparisons to be made, there needs to be some control for what is being attempted – in other words, variations will exist between technology intensive processes and those which are not.

4.6.2 IS Responsibility

Companies who indicated that they did not have an internal IS department were asked to specify who was responsible for the development of the firm's IT. This question consisted of six possible responses. These were 1) another company, 2) another Greek branch/subsidiary of the same firm, 3) another foreign branch/subsidiary of the same firm, 4) nobody 5) another department, and 6) other. The findings are shown in table 4.11 below.

Responsibility for IT (n=46)

	frequency	*% of respondents*
another company	26	57%
nobody	13	25%
other	4	9%
another branch/subsid. same co.	3	7%
foreign branch/subsid. same co.	3	7%
another department	2	4%

Table 4.11 : Who is responsible for IT?

Of those who do not have a separate IS department internally, the largest proportion used another company for IT services. This is expected with small firms whose needs may be limited or not frequently changing. The next most common response was that nobody was responsible for IT. Possible reasons for this could be that operations are disorganised, or that IT is not considered as being important enough to warrant special attention, or responsibility is equally shared, or problems are only dealt with as and when they arise and by whoever is 'closest' to the situation. This however is a worrying result.

4.7 Questionnaire Section Four : System Use

The last part of the questionnaire, section four, involved a series of questions that aimed to explore the issues of training, to assess how satisfied respondents are with their use of IT, and to investigate whether respondents felt that other actors (Unions and Government) played an important part in influencing IT use. The concluding section asks respondents to identify what other IT they would like to see employed in their firms and what problems they are experiencing or envisage in the future.

4.7.1 IT Training

Respondents were asked if training is or has been provided for staff for the technological systems that were identified as existing in the firm. A high proportion of respondents (87 per cent) said that training was provided (table 4.12). Training is often a main concern of companies, but problems are often associated with its costs. It is encouraging that Greek firms appear to attach a high importance to staff education. It reflects a recognition that skilled personnel are required to operate and manage the technology.

IT Training (n=83)

	frequency	*% of respondents*
provided	72	87%
not provided	11	13%

Table 4.12 : Provision of training for IT.

The respondents were also asked to comment on the frequency of the training. Equally encouraging results were obtained. Table 4.13 below shows that of the firms offering staff training, more than half claim to do so at regular intervals or frequently.

Frequency of IT training (n=72)

	frequency	*% of respondents*
frequently	41	57%
only when systems were installed	26	36%
other	5	7%

Table 4.13 : The frequency of IT training.

Without further investigation it is difficult to determine exactly how regularly staff are trained or what exactly the training involves. The 36 per cent response that indicated

that training was only given when systems were installed is what may have been expected as the norm. In this case however, training may have only consisted of a short talk by the technician who delivered and installed a system, to make sure that the user could switch it on. The overall impression that the results in this section gives is of a positive stance with respect to staff education. The use of appropriate training and education can be considered as part of IT infrastructure and thus imperative for its success.

4.7.2 IT Effects

The next six questions of the questionnaire attempted to measure how satisfied respondents were with their use of IT. Five response choices were given to assess respondent's perceptions of the effects of IT in each of the following areas:

- profit
- growth
- stability
- workload
- quality

and

- staff reaction.

4.7.2.1 Profit

One of the prime motives of firms when they invest in IT is that profits may be enhanced. In practice however, cause and effect are difficult to measure, and in many cases the consequence is that increased profits can not be explicitly attributed to IT use. In the manufacturing sector however, to which most of the respondent firms belong, where IT is employed in the production process (e.g. CIM/CAM), it is easier to

measure the effects of IT. This can often be in terms of cost savings due to redundancies, improved speed of production etc.

The respondents indicated a strong belief (73 per cent) that IT had influenced profits positively (table 4.14). A minority (7 per cent) were extremely satisfied with the relationship between IT and profit.

Profit (n=83)

	frequency	*% of respondents*
increased	55	66%
no change	22	27%
increased considerably	6	7%
decreased	0	0%
decreased considerably	0	0%

Table 4.14 : The effects of IT on company profits.

There was however a relatively large proportion of respondents (27 per cent) who believed that IT had no effect on profit. Some of these respondents may have operations that can only be performed with IT and some may be concerned with the costs involved with IT development which can often (at least in the short term) outweigh the benefits gained in employing technology. No firms believed that IT had a detrimental effect on profits. This indicates potentially successful uses of IT.

4.7.2.2 Growth

The employment of IT can often assist in the growth of a firm. This can be a result of several occurrences. It may be the case that operations have reached such a complex stage (eg. design of a car, volume of transactions) that without the use of IT, growth would be impossible. When IT is employed to replace various labour processes, as is

often the case in the manufacturing sector, extra staff may be made available to assist in other activities which can promote company growth (eg. marketing, sales, design).

Respondents were asked to comment on whether they felt that their companies grew as a result of the employment of IT. The results were very positive (table 4.15). 73 per cent of respondents believed that IT had allowed their firms to grow considerably and 17 per cent believed that growth had occurred.

Growth (n=83)

	frequency	*% of respondents*
growth	61	73%
considerable growth	14	17%
no growth	7	8%
shrunk	1	1%
considerably shrunk	0	0%

Table 4.15 : The effects of IT on company growth.

The fundamental problem with asking this type of question is that concepts such as growth can be interpreted in so many different ways. When a specific meaning such as 'staff levels' is assumed, then the goal may be to shrink. This may be what the respondent who indicated that the firm shrunk implied. The other case is where an industry-wide application of IT causes the structure of an industry to change. This may allow competitors to enter the industry, hence reducing the market share of individual firms – causing individual firm shrinkage.

4.7.2.3 Stability

Respondents were asked to provide information on whether they thought that their firm's use of IT affected its stability in any way. As with the previous two questions (profit and growth) results were generally positive (table 4.16).

Stability (n=83)

	frequency	*% of respondents*
more stable	55	66%
much more stable	23	28%
no change	5	6%
less stable	0	0%
much less stable	0	0%

Table 4.16 : The effects of IT on the stability of operations.

28 per cent of firms were very optimistic and believed that their IT helped to make company operations much more stable. The problem arises (as discussed in Section 4.6.1.1 above) that without any triangulation methods such as the use of interviews and/or observation such responses needed to be treated with caution. The respondent may simply wish to create a positive image of their organisation and may consider stability to be just another 'good' thing. The problem is in interpreting what 'stability' actually is and what its implications are. Where stability can be considered to create a more predictable work environment (to be explored by further research) then this may be important in terms of Hofstede's UAI dimension.

The Greeks rank number 1 on Hofstede's (1991) Uncertainty Avoidance scale (cf. table 2.1). This shows that they feel threatened by uncertain or unknown situations. Company stability is likely to be an important consideration. If IT can be associated with increased stability of operations, it is likely to be more easily [culturally] acceptable.

4.7.2.4 Workload

Respondents were not as satisfied with their IT when asked to comment on its effects on workload. Nearly half (41 per cent) of respondents believed that IT did not affect or had led to an increased workload. These may have interpreted the question to mean 'increased output', and may consider this as a favourable outcome of IT. In some cases however, it is possible that IT has *enabled* a firm to do more, but at the same time has caused an increase in workload in terms of IT operating procedures (e.g. data input). More than half (59 per cent) the companies identified IT as being responsible for a decreased workload.

Workload (n=83)

	frequency	*% of respondents*
decreased	46	55%
increased	16	19%
no change	13	16%
increased considerably	5	6%
decreased considerably	3	4%

Table 4.17 : The effects of IT on workload.

4.7.2.5 Quality

The results where respondents were asked if the quality of their work had improved due to the installation of IT were extremely positive (table 4.18). All but one firm believed that either quality had improved (54 per cent), or that it had improved considerably (45 per cent).

Quality (n=83)

	frequency	*% of respondents*
improved	45	54%
improved considerably	37	45%
no change	1	1%
deteriorated	0	0%
deteriorated considerably	0	0%

Table 4.18 : The effects of IT on quality.

Precisely how to measure quality is an entire problem in itself, and certainly outside the scope of this research. The response to this question is valuable in that it is an indication that IT is perceived in an extremely positive way. This is encouraging.

4.7.2.6 Employee Reaction

Staff reaction can be the determining factor deciding the success or failure of IT. Often employees feel threatened by the prospect of redundancy and react in negative ways to the introduction of new IT. The results shown in table 4.19 are again very encouraging.

Staff Reaction (n=83)

	frequency	*% of respondents*
positive	43	52%
very positive	25	30%
indifferent	11	13%
negative	4	5%
very negative	0	0%

Table 4.19 : Reaction of staff to IT.

Only 5 per cent of respondents reported that there were negative staff effects toward IT. A small proportion (13 per cent) felt that staff were indifferent to the technology and a large proportion said that staff reactions were positive (52 per cent) or very positive (30 per cent). A technological culture which creates positive staff attitudes is important for the successful adoption of a new technology. Several respondents complained of a lack of appropriate culture.

4.7.3 Other Influencing Actors

The following two questions were designed to explore whether respondents perceived that their IT development or use was influenced by part of a wider 'actor-network'. Two possible RSG's were suggested (unions and government) and respondents were asked to comment on their influence for IT development or use.

4.7.3.1 Unions

If employees were affiliated to a union (table 4.20), respondents were asked to indicate whether the union influenced the development or use of IT. The results of this question need careful interpretation.

Existence of Union (n=83)

	frequency	*% of respondents*
not affiliated	70	84%
affiliated	13	16%

Table 4.20 : Union affiliation of firm's employees.

Only 23 per cent of those who have union involvement could identify that unions had any effect on the use or development of IT (table 4.17). The majority (77 per cent) indicated that unions had no effect.

Union effects (n=13)

	frequency	*% of respondents*
no effects	10	77%
positive effects	2	15%
negative effects	1	8%

Table 4.21 : The effects of unions on IT.

It is difficult to draw conclusions from this question because of the small size of the sample. However, if the indication that unions have no effect can generally hold, this may raise certain concerns. Unions may be interested to limit redundancies or deskilling from the implementation of technology. The opinion that is voiced in these results is predominantly that of management. The results must be interpreted in the light of that fact.

Where an economy faces technological change, the possible effects on the labour market generate social interest. This is because technological changes are considered to be labour-saving or capital-intensive. Often various RSG's emerge, one completely opposed to the introduction of any modern labour-saving technology, and another who believe that the latest technology is the only choice for rapid growth (Podder, 1988). These RSG's are typically unions and management respectively.

4.7.3.2 Government

The results of respondents' opinion as to whether they felt that government played a role in the development or use of IT are shown in table 4.22 below. It is interesting to note that less than half of the respondents (35 per cent) felt that the Government played any part in IT at all.

Government (n=83)

	frequency	*% of respondents*
no effects	54	65%
positive effects	20	24%
negative effects	9	11%

Table 4.22 : The effects of government on IT.

Of the respondents who noted Government's effects, 11 per cent felt that they were negative. Further research would be useful to ascertain exactly why respondents reacted in this way. This type of question is inevitably value laden and can only act as a guide as to whether people acknowledge government as an influential (positive or negative) actor or not.

4.7.4 IT Positioning

To explore the general feeling of satisfaction or dissatisfaction with IT, respondents were given the opportunity to think about their position (in terms of IT) in relation to other firms. This allowed respondents to indicate if they felt that they could be doing better or not. The results are summarised in table 4.23.

IT Position Compared to Others (n=83)

	frequency	*% of respondents*
similar	37	45%
superior	28	34%
considerably superior	9	11%
inferior	5	6%
considerably inferior	2	2%
don't know	2	2%

Table 4.23 : How firms position themselves in relation to others in terms of IT.

The majority of respondents felt that their IT installations were similar to those of other firms and many (34 per cent) considered their IT to be superior to that of others. In so far as many firms linked IT use with a strategic motive (81 per cent, table 4.10), they may also be reluctant to publicise the details of their installations. It would be difficult for a firm to really know how they compare with others and these results serve more as an indicator of 'satisfaction' with IT – than anything else.

The results to this question are congruent with those of the preceding questions which produced positive data. The last questions in the section looked at respondent's IT desires, what else was felt as needed, and what problems were being experienced or were predicted for the future.

4.7.5 IT Desires

The respondents were asked if they wanted to employ or felt the necessity for any other IT systems in their firm. More than half expressed some desire to add to their IT (65 per cent). The rest (29 per cent) did not respond. This may be because they are content with what they use or that they do not know what else is available.

The responses of those who had some further IT needs can be classified under the following headings:

- external communications
- software

and

- hardware.

Appendix 2 shows the detail in each category. In the hardware category, desires were for simple devices such as printers, scanners, plotters and CD-ROM drives. The software category revealed many of the basic applications (eg. stock control, DTP) but the most frequently occurring is characteristic of the industry researched. Half of the software desires were for CAD/CIM/CAM applications. It is interesting that the general level of satisfaction with IT, as shown in the previous sections, was extremely positive, but at the same time, many firms are lacking applications that may be fundamental to their businesses such as CAD.

Although external communications can be expressed in terms of the other two categories, software and hardware, it has been classified separately here because it indicates a desire to communicate with others or acquire access to information. Telematic networks were most commonly desired. These could have several uses such as links to databases, bulletin boards, and various information services; or could simply indicate a desire for a WAN or LAN.

What ever the precise implication, it is clear that there is a general tendency that Greeks wish to organise their work so as to work together. This may relate to Greece's position (30th) on Hofstede's (1991) Individualism scale (cf. table 2.1). Greece appears to be extremely collectivist when compared with the USA (1st) or Great Britain (3rd). It is however difficult to make these types of 'cultural conclusions' from the questionnaire data. The enthusiasm that many of the respondents have for networking technologies may simply be due to global trends. Networking was traditionally expensive and demanded considerable computing resources. It has become simpler, cheaper and more available. Recent improvements/provision of the Greek public networks operated by the Greek telecommunications utility OTE may have also generated some demand for networking technology.

Several firms also indicated that they wanted to use e-mail, Internet connections, and EDI. Some have identified a persistent problem with the infrastructure and requested better telecommunications services (line quality etc.).

4.7.6 Problems

The final section of the questionnaire explored respondents' problems with their use or development of IT. The question was worded in such a way that respondents could

mention current or predicted problems. Some companies (35 per cent) did not declare any problems. The remainder (65 per cent) identified problems that could be classified in approximately 8 categories. Table 4.24 lists these, together with the proportion of total problems that each accounts for.

Problem Category	*% of problems*
Staff	37
Speed of technological advances	14
Support	14
Costs	10
Under-utilisation of technology	9
Compatibility	5
Communications quality	5
Availability of information	4
Lack of software	2

Table 4.24 : IT problems.

When looked at carefully, it would appear that some of the problems identified are symptoms of the others. This will become clearer in the following discussion.

The highest proportion of perceived problems were those associated with staff (37 per cent). Concerns about staff and IT were in the following areas:

- negative staff reactions
- steep learning curves
- lack of specialised staff in region
- training (including costs of)

and

- redundancies.

Training was the most commonly mentioned problem, followed by (and associated with) the steep learning curve. It seems that the respondents were most concerned with the lack of staff skills and mentioned the need for more training (as a solution).

Support was the second highest frequently occurring problem (14 per cent). As can be seen from table 4.1, the highest proportion of respondents were from areas other than Athens and Thessaloniki (the main cities). Problems in the 'support' category included a lack of local suppliers, a lack of a local labour force with specialised skills, a lack of specialised services (e.g. VAN) and a lack of financial support. Many of these problems are not experienced by the firms in the Athens or Thessaloniki areas and indicate shortcomings in the support infrastructure for IT in Greece. Over-concentration of services and markets in a few areas is typical of underdeveloped regions.

The staff training problem may be a consequence of the third most frequently mentioned problem – the speed of technological advances (14 per cent). Firms are having particular problems in keeping employee skills up-to-date. Re-training is needed to keep up with the pace of development of technology.

The next problem that concerned respondents related to the costs of technology (10 per cent). Again, a large part of this is a function of the need to keep staff skills up to date, as a result of the speed of technological advance. The lack of finance mentioned in the support category is also related to this. Costs of software and training were particular concerns of the respondents.

The underutilisation of technology was identified as a problem (9 per cent). This is again associated with the speed of technological advance, leaving skills redundant, which requires training, which can be costly. Some firms also mentioned the lack of an IT culture as responsible for poor use.

The remaining problems that were identified by respondents included compatibility (5 per cent), communications quality (5 per cent), availability of information (4 per cent), and a lack of software. The issue of compatibility included concerns of connectivity and integration across networks. Some respondents were worried about the compatibility of old systems with new.

As far as many of these problems are symptoms of the others, it would be worthwhile determining which is the root problem so that it can be attended to and solutions found. Without further research it is difficult to determine this. The speed of technological advance is an 'external' problem (probably near to the root problem). It is external in that it can not be acted upon (as a problem) by any one firm. The other major problem, that of staffing, is one which has many solutions. The positive attitude of respondents toward staff training (identified in section 4.7.1) will ensure that the problem of staff education does not become an excessive burden for Greek firms.

4.8 Trends

At this stage it will be useful to draw comparisons between the data analysed above (the 1995 data), the S90 data, and the Doukidis et al study (1994). By doing this, some IT trends in Greece can hopefully be identified. In terms of 'soft' IT issues in Greece, the S90 and the Doukidis et al research are the most extensive to date. They differ in several ways from the study in this thesis but there are also many similarities which makes comparison both possible and valuable.

By comparing the results of these separate investigations and identifying patterns in the data, a picture of the 'context' of IT in Greece may be developed. The S90 data was collected at three year intervals (1986, 1989 and 1992). The data in this thesis can

provide some of the fourth interval for 1995. In so far as 65 per cent of the respondents for 1995 claimed to have installed their IT 'in the last 5 years' (cf. table 4.8) and since several of the respondent firms were founded recently (cf. figure 4.2), the 1995 data highlights some more recent IT directions.

Unfortunately, in the 1995 data there was no control for determining the specific sectors that firms belonged to. Nevertheless the S90 data is similar in that it mainly concentrates on the 'manufacturing' sector. By looking at the company names (from the respondents who disclosed them), a similar range of sectors (food, wood, textile, engineering etc.) can anyway be identified — although exact numbers of firms in each sector cannot be determined, the two sets of data can be assumed to be in many ways similar (at least for the purposes of exploratory research).

4.8.1 Application Trends

The S90 data revealed that the bulk of software applications in use were for relatively simple 'administrative' functions. These included applications such as accounting and payroll. An increasing use of CAD/CAM was identified and by 1992, 31 per cent of respondents claimed to use applications of this type. The 1995 data showed a similarly high usage of administrative software (as expected) but did not show any noticeable increase in the use of CAD/CAM. In fact, half of the 'desires' that respondents had for software were for CAD/CAM systems for their production efforts. Some even mentioned the lack of availability of suitably advanced CAD/CAM programmes in Greece (a supplier problem).

4.8.2 IT and Management

One of the main concerns of the analysts in the S90 study was the lack of direct use of IT by management. Only 20 per cent of users were accounted for by management groups. One of the main worries that management reported (as a reason for not using IT) was a lack of suitable software for managerial use. The 1995 data shows a slight increase in management use (to 24 per cent). Given that the most common motive given by respondents (who were mostly managers) for implementing IT was 'for strategic reasons', then, even if management don't use IT directly, their appreciation of its importance has been demonstrated. There were three firms who said they used a Management Information System (MIS). This could indicate the beginning of an upward trend in the use of this 'class' of 'managerial' software.

4.8.3 Information Systems Department Trends

The 1995 data shows that only 45 per cent (table 4.5) of companies claimed to have their own IS department. This is a sharp drop when compared to the S90 data which showed that 20 per cent of firms had not set up internal IS departments. The fall in the number of firms claiming to have an IS department could be due to several factors. This could be because the 1995 data consists of more small businesses – which have previously been identified as being less likely to set up their own IS department (Doukidis and Smithson, 1995). Alternatively, this trend could reflect a move toward 'outsourcing'. Greek firms have expressed concerns with the costs of maintaining IT, particularly due to the rapid advances in technology. The costs of internal IS departments may be rising and using external vendors may be proving to be cost-effective. Further investigation is required.

An interesting trend can be seen with the size of IS departments. The average number of employees has risen in the 1995 data to 7.8 people. This is shown in figure 4.3 below.

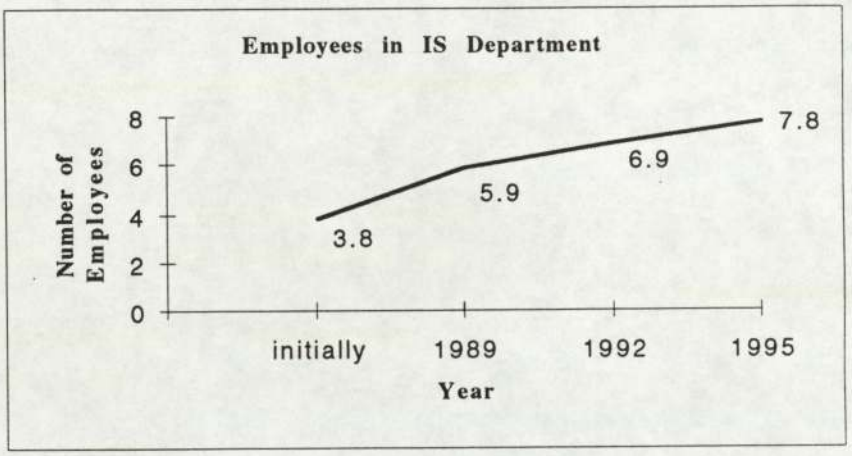

Figure 4.3 : Average number of employees in IS departments.

So while the number of IS departments within firms appears to be falling, the average size of those which can be identified has appeared to increase. It would be interesting to investigate the size of other departments to see if a shift toward 'IT intensive manufacturing' is emerging – coupled with the contraction of 'traditional' functions.

4.8.4 IT and Strategy

It would appear from the information provided by companies with regard to the reasons for having their own IS departments that many more (than in the S90 study) are appreciating the strategic value of IT. Strategic reasons were cited in 81 per cent of cases (table 4.6). The large proportion of respondents who would like to implement CAM and CAD is further evidence of the move toward 'strategic IT'. CAM would affect the 'heart' of many of these firms – a move away from IT's dominance in the 'support' functions of these firms (payroll, accounting, etc.). The possible increase in managerial use (including MIS) is a further indicator of this.

4.8.5 Problem Trends

The S90 study showed that some of the main worries of the respondents were the lack of awareness of IT and the difficulties with suppliers. These problems still featured prominently in the 1995 data. Some firms suggested that the lack of an appropriate IT culture was inhibiting the successful use of technology and was also responsible for its underutilisation. Many difficulties with suppliers were again reported in the 1995 data. This was especially true of the firms who were not located in or near one of the main cities (Athens or Thessaloniki). The problems with suppliers were generally because of slow support (especially when things went wrong), inexperienced staff, and a lack of after-sales help.

The main problems that had been identified by the Doukidis et al (1994) study were training, power failures, supplier incompetence, and staff. Many of these appear at the top of the list of problems in the 1995 data. Power failures were not reported but one respondent said they had installed a UPS device (uninterruptable power supply). There was a drop in the problems reported with suppliers from 20 per cent (Doukidis et al 1989 data) to 14 per cent (1995 data). Staff and training together accounted for 44 per cent of problems in 1989 (Doukidis et al data). The 1995 data shows a slight decrease in these types of problems (37 per cent – classed as 'staff' – cf. table 4.24). The positive attitude of respondents toward staff education and training (cf. section 4.7.1) may be helping to alleviate some of the 'staff-related' problems. A definite increase in the provision of training was shown (13 per cent no training in the 1995 data, compared with 26 per cent no training in the Doukidis et al study).

4.8.6 Satisfaction

The S90 study reported that firms had generally optimistic attitudes toward the use of IT. It was suggested that this may have been because Greek firms were in the early stages of IT use ('honeymoon period') and had yet to gain sufficient experience to notice serious problems. The 1995 data still revealed extremely promising attitudes toward the use and development of IT. The problems that were reported with IT were similar to those of previous studies, and many can be considered as symptoms of the others. Most of the problems are those which can be expected and give no reason for serious concern. Only a tiny minority of respondents expressed any real dissatisfaction with their IT. A majority of the respondents expressed an intention to expand their IT operations in the future. The high use of and demand for network technology is congruent with the indications of cultural studies – a collectivist affinity – and will ensure a successful integration of IT with Greek working practices.

Chapter Five
Summary and Conclusion

5.1 Research Problems

Research is not complete without some discussion of its intrinsic failings. All research is inherently value laden because researchers' values inevitably influence the choice of phenomenon, method, data collection and interpretation of findings. The choice of method determines many of the remaining research processes, including the manner in which the results are interpreted.

It is hoped that the relativist or grounded approach to research which has been attempted in this thesis has helped the research to take an 'investigative' or exploratory flavour. Strong conclusions have not been drawn because this study has not aimed to be conclusive, but rather, the goal has been to provide a background for further work.

Particular research problems have arisen with respect to the analysis in this study. The questionnaire had originally been designed as the first stage of a much larger project. Certain questions had been designed to align with an interpretive ideology and others to generate simple statistical data to act as reference information. One of the fundamental aims had been to associate more closely the ideas of the works on national culture with the IT findings. The questionnaire was designed as only the first step in this approach. The study had been designed with the aim of conducting follow-up interviews (31 per cent of respondents had expressed a willingness to participate) which would have provided a much richer data set to complement the questionnaire data. Differences in 'observed' realities and respondents' views as expressed on the

questionnaire could have provided information to complete a more thorough cultural analysis.

There were problems with comparing the data of this study with that of others. This was due to differences in the sample sizes, differences in the questions asked, differences in the 'composition' of the samples, and the like. However, some of these differences were not important because the aim has been to generate a 'picture' of IT use in Greece. For this, all the works referred to can be seen as complementary. Each study has made a particular contribution to the overall picture of Greek IT. It would have been more of a problem if the use of statistical modelling was required. This was avoided because of the difficulties in gathering a sufficient volume of data and because it is unnecessary to do so with the methodological approach that has been applied.

It is hoped that the results of this study will inform future research on IT in Greece and that a priori assumptions derived from "US research" will be treated with caution, or at least an attempt made to identify them as they are often tacit. On this basis, the perspectives, assumptions, literatures, and concepts that have been applied have been chosen with the primary objective of identifying a pattern of IT use in Greece. Inescapable is the fact that other perspectives and rationales have been ignored, abandoned or given only brief consideration. The relationship between European Commission Policy and the Greek government's IT policies is an example. This and many other ideas used in this research may be more complex than their presentation and treatment here, however, the important elements and features have been used to inform this research.

5.2 Summary

The results of this study have provided a picture of the state of IT use for a set of small businesses in Greece. The generalisability of results is not an issue because of the methodology employed. The respondents have been identified as one particular relevant social group. It is likely that the results presented here are a good representation of IT use in Greece, but proof of this has not been a goal at this stage. The respondent RSG consisted mainly of managers (educated) who worked in (or owned) generally small firms. Many of the respondent firms were located in areas outside of the main cities (Athens and Thessaloniki). This has possibly provided a different emphasis in results to that of previous studies.

In terms of the technology that respondents perceived important enough to report on, the PC was the most popular. Network technology was shown to be in extensive use, and heavily demanded. This may point to a cultural affinity of 'collectivism' as suggested for Greece by Hofstede (1991). Software use was found to be similar to that found in previous studies (generally administrative), although an increase in managerial use was recorded. Some of the most popular applications that firms hoped to acquire in the future included CAD and CAM. Respondents also placed a greater 'strategic' emphasis on IT use than that found with previous research. The future implementation of systems like CAD/CAM will hopefully reinforce this.

The overall attitude of respondents toward their use of IT was extremely positive. Most respondents believed that IT had helped to enhance profits, improve the stability of operations, promote company growth, improve quality, and reduce workloads. Staff attitudes were reported as being, on the whole, also positive. The importance of other actors in influencing the use and development of IT (Government and Unions)

was not recognised. Most respondents were confident that their IT was similar or superior to that in use at other firms. There was a strong desire expressed for greater connectivity with databases and external networks.

The majority of problems reported concerned staff. Lack of specialised labour, steep learning curves, and training, were some of the main worries also expressed. A high proportion of the problems identified were symptoms of other problems and hence the difficulties seemed greater than they may actually be. There were very positive attitudes toward staff education and training. An increase on previous data was recorded for the provision of training. This is encouraging and may result in a decrease in the general problems, many of which seemed to stem from employee-related issues.

In general, Greeks in this study appear to be implementing IT with exceptionally successful results. The use of networking technology may be facilitating this from a cultural point of view. In the past networks have been mainly associated with larger enterprises. The use of multi-user (UNIX) and network technology in small Greek firms may be more culturally acceptable than the use of stand-alone technologies. Centralised data storage may help reinforce Greece's strong Power Distance tendency. Many respondents plan to make positive developments and this completes a generally positive picture of IT use in Greece.

5.3 Future Research

Empirical IT/IS studies have largely ignored cultural factors. The extent to which the findings of these studies are generalisable across different countries is unknown. Future research can aim to shed light on this issue by replicating existing studies in a range of cultures to isolate universal from culturally-specific IT/IS impact. Future

IT/IS studies can also try to use methods that measure cultural dimensions to ascertain the cultural environment within which these studies are conducted. This will allow the results of these studies to be interpreted with cultural factors in mind.

The cultural results in this study are very limited as the questionnaire was not an appropriate vehicle for collecting this information. As already mentioned in section 5.1 the questionnaire has been designed as part of a larger study which would have made fuller cultural conclusions. The future use of interviews would be imperative in order to adequately complete this study and to make more firm conclusions. The use of interviews would also have enabled the correct use of an 'interpretive methodology' which it was hoped would 'drive' this research. As it stands (cf. section 3.7), this research has failed to mobilise an interpretive methodology because the questionnaire used was largely inappropriate. The advice for future researchers in terms of methodology and research tools would be not to attempt to operate an interpretive methodology using the 'questionnaire' alone.

It is hoped that this study has provided some further information to complement the previous work on IT in Greece. Regions of the world such as Greece are different in many ways to those in which most IT research has taken place. IT research that relates to organizational and managerial issues can be valuable in ensuring the successful utilisation of the technology. Only with a proper understanding of the context in which this technology will be operated and managed can meaningful theory be developed. This thesis aims to provide a picture of part of that context.

AMT	Advanced Manufacturing Technologies
AUEB	Athens University of Economic and Business
CAD	Computer Aided Design
CAM	Computer Aided Manufacture
CIM	Computer Integrated Manufacture
COPICS	Communication Oriented Production Information and Control System
DTP	Desk Top Publishing
EC	European Community
EDI	Electronic Data Interchange
E-Mail	Electronic Mail System
GDSS	Group Decision Support Systems
GSS	Group Support System
IM	Information Management
IND	Individualism
IS	Information Systems
IT	Information Technology
LAN	Local Area Network
MAS	Masculinity
OA	Office Automation
PDI	Power Distance
RSG	Relevant Social Group
S90	Smithson et al's (1990) study
SB	Small Business
SCOT	Social Construction of Technology
UAI	Incertainty Avoidance
WAN	Wide Area Network

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Appendix One
Technological Keywords

Technological keyword/phrase	*Occurrences*
Accounts Software	14
Autocad	1
Barcode System	1
Bespoke Software	1
CAD	5
CAM	2
CD ROM	2
Colour Monitors	1
Communications System (central)	1
Computers	5
DOS	7
DTP	3
Data Acquisition	2
Database	7
Design Software	2
Digitiser	4
Distribution Control	1
Dot Matrix Printer	5
Drawing	1

EDI	1
Electronic Weighing Machines (Networkable)	1
Electronic Wood Drying System	1
E-mail	3
Excel	2
Fax	11
Fax (computer based)	2
Fax/Modem	4
Graphics Software	2
Hellaspac Lines	2
IBM AS400	7
Information System	2
Ink Jet Printer	2
Internal Communications	1
Internet Access	3
Internet Host	1
Investment Software	1
LAN	8
Laser Printer	9
Light Meters	1

MIS	3
MRP	1
Machine Tools Controller	1
Macintosh	6
Macintosh Network	1
Microscopes	1
Milk System	1
Microsoft Office	3
Mobile Phones	2
Modem	13
Multimedia	3
Network	15
Novell Network	23
Office Automation	3
Office Equipment	1
Optical Character Recognition (OCR)	1
ORACLE	1
Orders System	1
PC	42
Parts Manufacture	1
Photocopier	6
Plotter	5
Pricing Software	2

Production Control	3
Production Schedule	1
Production Software	2
Programmes	1
Programming Language	2
Projectors	1
Research and Development	1
Sales	1
Satellite Distribution	1
Scanner	7
Servers	8
Simulator	1
Smart Cards	1
Software	3
Sound Studio	1
Staff Barcode Clock System	1
Statistics Software	1
Stock Control	4
TV	2
Tape Streamer	1
Telephone Network	8
Telex	3
Terminals	5

Touch Screen	1
Training Software	3
Tube production	1
UNIX	13
Uninterruptable Power Supply (UPS)	1
Video	2
Windows	8
Windows Network	11
Wood Treatment Control System	1
Word	2
X-Ray System (digital)	1

Appendix Two
Respondents IT Desires

Software

CAD/CAM

data capture

DTP

multimedia

simulation

software generally

stock control

quality control

virtual reality

Hardware

CD-ROM drive

colour printer

monitor

networks

plotter

scanner

External Communications

database access

EDI

e-mail

improved telecomms services

Internet access

telematic networks

videoconferencing

INFORMATION TECHNOLOGY QUESTIONNAIRE

INFORMATION TECHNOLOGY QUESTIONNAIRE

The responses that you are about to give will remain completely anonymous. The published results will only be aggregate statistics, and it will be impossible to identify individual companies from them.

PART ONE
THE COMPANY AND YOURSELF

❖ 1α) How many employees does the company have? ☐

❖ 1β) The company is: (mark one box)

Greek ☐ Foreign ☐ If foreign, from which country? ☐

❖ 1γ) Has the company other branches or subsidiaries? (mark one box)

No ☐ Yes ☐ If yes, how many? ☐

❖ 1δ) What is your position in the company? ☐

❖ 1ε) How many years have you worked for the company? ☐

❖ 1στ) Are you a graduate of an establishment of higher education?

Yes ☐ No ☐ If not, are you a graduate of any other establishment? If yes, which one? ☐

❖ 1ζ) In what year was the company founded? ☐

PART TWO
TECHNOLOGICAL SYSTEMS

❖ 2α) Which technological systems are used in the company?

❖ 2β) Internal Use

❖ 2β.1) Which of these are dedicated to internal use only?

❖ 2β.2) When did the company begin to use such systems? (mark <u>one</u> box)

In the last 5 years ☐

Between 5-10 years ago ☐

More than 10 years ago ☐

Other (please state) ☐

❖ 2β.3) In which departments are they used? (Fill in the department's name and the systems used)

DEPARTMENT	SYSTEM

❖ 2γ) External Use

❖ 2γ.1) Which of the systems are for external communication /use? (e.g. wide area network);

❖ 2γ.2) When were such systems first used in the company? (mark <u>one</u> box)

In the last 5 years ☐

Between 5-10 years ago ☐

More than 10 years ago ☐

Other (please state) ☐

PART THREE
SYSTEM DEVELOPMENT

❖ 3α) Does the company have an information systems department for the development of systems?

No ☐ Yes ☐ → If yes, please go to question 3γ

❖ 3β) Who is responsible for systems development?

Another company ☐

Another Greek branch or subsidiary ☐

A foreign branch or subsidiary ☐

Nobody ☐

Another department (please give name) ☐

Other (please state)

☐

PLEASE GO TO SECTION 4

❖ 3γ) Information Systems Department.

❖ 3γ.1) For what reasons does the company have an information systems department? (please mark as many as applicable)

Financial/Economic ☐

Strategic ☐

Quality ☐

Inadequate external knowledge ☐

Other (please state)

☐

❖ 3γ.2) How many employees does the information systems department have? ☐

❖ 3γ.3) In which year was the information systems department founded? ☐

PART FOUR
USE OF SYSTEMS

❖ 4α) Is training provided for the staff who use technological systems?

Yes ☐ No ☐ → If no, please go to question 4γ

❖ 4β) Is the training provided at regular intervals?

Yes ☐

No, was only provided when systems were installed ☐

Other (please state)

☐

❖ 4γ) The information systems have affected profits so that they have... (mark one box)

Increased significantly	Increased	No change	Decreased	Decreased significantly
☐	☐	☐	☐	☐

❖ 4δ) The information systems have affected the development of the company, so that it has... (mark one box)

Grown significantly	Grown	No change	Shrunk	Shrunk significantly
☐	☐	☐	☐	☐

❖ 4ε) The information systems have affected the stability of company operations such that they have become...(mark one box)

Much more stable	More stable	No change	More unstable	Much more unstable
☐	☐	☐	☐	☐

❖ 4στ) The information systems have affected the workload of the employees such that it has...

Increased significantly	Increased	No change	Decreased	Decreased significantly
☐	☐	☐	☐	☐

❖ 4ζ) The information systems have affected the quality of company operations such that they have...(mark <u>one</u> box)

Improved significantly	Improved	No change	Worsened	Worsened significantly
☐	☐	☐	☐	☐

❖ 4η) The reaction of staff towards new technological systems has been... (mark <u>one</u> box)

Very Positive	Positive	Indifferent	Negative	Very Negative
☐	☐	☐	☐	☐

❖ 4θ) Is there a union?

Yes	No	
☐	☐	→ If no. please go to question 4ια

❖ 4ι) Does the union affect the use or development of systems? (mark <u>one</u> box)

Yes (With positive results)	Yes (With negative results)	No
☐	☐	☐

❖ 4ια) Does the government affect the use or development of systems? (mark <u>one</u> box)

Yes (With positive results)	Yes (With negative results)	No
☐	☐	☐

❖ 4ιβ) Which other technological systems would be useful in the company?

❖ 4ν) Comparing your company with others, with respect to technological systems, do you believe that your company is... (mark <u>one</u> box)

Very Advanced	☐
Advanced	☐
In a similar position	☐
Behind	☐
Very behind	☐
Don't know	☐

❖ 4ο) What are the problems, or what do you predict will be the problems, with the development and use of technological systems?

THANK YOU FOR COMPLETING THE QUESTIONNAIRE. We would like to remind you that the responses that you have given will remain completely anonymous. The published results will only be aggregate statistics, and it will be impossible to identify individual companies from them.

Part of this research includes interviews. Would you be able to take part in these? If yes, please give your details on the enclosed form and tick the appropriate box, so that we will be able to contact you.

If you would like to receive the results of this research, please give your details on the enclosed form and tick the appropriate box.

PLEASE RETURN THE COMPLETED QUESTIONNAIRE IN THE PREPAID ENVELOPE PROVIDED.

❖ THANK YOU ❖

INFORMATION TECHNOLOGY RESEARCH

YES I WOULD LIKE TO TAKE PART IN THE INTERVIEWS ☐

YES I WOULD LIKE THE RESULTS ☐

NAME
COMPANY NAME
ADDRESS
TELEPHONE
FAX
E-MAIL