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The Aston Centre for Servitization Research and Practice has been established to guide suitable businesses through the transition from selling products alone to competing through Product-Service Systems. Focusing on mainstream manufacturing, the Centre engages and impacts on local, national and international businesses through innovative research and education programmes and bringing academics and business leaders together at its annual Spring Servitization Conference, and a number of other events, workshops to promote servitization. We also deliver two modules on servitization as part of Aston Business School's MBA programme, namely; Developing a Technology-Led Service Strategy and Transforming to Technology-Led Services. Current projects include:

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Working in partnership with the Advanced Manufacturing Research Centre at the University of Sheffield, and the Serious Games Institute at Coventry University, this EPSRC funded programme is developing applied game technologies to transform the servitization of mainstream manufacturing companies.

Aston Centre for Servitization Research and Practice acknowledges the support and research funding from:



Conference Partners



ACKNOWLEDGEMENTS

The conference Chairs would like to thank Aston Business School for hosting the Spring Servitization Conference (SSC2014). We would like to thank all of our overseas and contributing authors and delegates for the high quality of papers submitted and the range of topics addressed. We trust that SSC2014 will be remembered for being informative, enjoyable and for providing thought leadership in this fast-moving competitive arena. We also hope that opportunities for interaction and exchange of ideas are taken by delegates. Academic aspects of the conference, particular the refereeing of the papers, have been undertaken by an external panel and all have been subject to double blind review.

Tim Baines, Ben Clegg & David Harrison

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INTRODUCTION

Welcome, the servitization story continues. Our goal with the Spring Servitization Conference is to accelerate the adoption of servitization and Product-Service Systems through three objectives:

- Engage the international thought and practice leaders from across organisations and disciplines.
- Create an open and collegiate environment where theory and practice can be shared, contrast and debated.
- Constructively integrate industry and academia in a broad and inclusive community.

These objectives however present a raft of challenges; although practitioners and academics share an interest their motives for participating differ, and indeed the academic community itself can be fragmented. We have worked hard to develop conference processes that recognise these differences, minimise the barriers to collaboration, and create a friendly and inclusive environment. In particular this year we have:

- A single conference stream helping to ensure strong participation and intensive debate
- Keynotes from senior executives at leading manufacturers and academics
- A medley of poster presentations from SMEs adopting advanced services
- Double blind refereeing of papers and publication in proceedings
- A discounted joining fee for joint industry-academic presentations

In addition we also want to recognise the contributions being made to move forwards the debate on servitization, and so we have awarded prizes for:

- Best paper about Information Technology enablement of servitization
(Awarded by the UK Council for Electronic Business)
- Best paper bridging theory and practice on Servitization
(Awarded by PTC Inc.)
- Best industrial project describing a servitization transformation
(Awarded by Barclays Plc.)
- Best paper describing a novel business model in Servitization
(Awarded by Pera Training)

These are still early days for the conference, and we still have much to learn both about servitization and the processes by which we bring our community together in this very dynamic area. We believe that the papers in these proceedings testify that we are making progress, but we believe that we have only just started to realise our goals.

We would like to thank you for supporting the conference this year, and that you find it both productive and enjoyable.

Tim Baines, Ben Clegg and David Harrison
May 2014

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ACADEMIC KEYNOTE PAPERS

LITERATURE REVIEW: PRODUCT SERVICES FOR A RESOURCE-EFFICIENT AND CIRCULAR ECONOMY¹

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ABSTRACT

Since the 1990s, Product Service Systems (PSS) have been heralded as one of the most effective instruments for moving society towards a resource-efficient, circular economy and creating a much-needed ‘resource revolution’. This paper reviews the literature on PSS in the last decade and compares the findings with those from earlier reviews from 2004 and 2006. The literature of the last seven years has refined insights with regard to the design of PSS, as well as their business and environmental benefits, and confirmed the definitions and PSS concepts already available in 2006. A major contribution of the recent literature is research into how firms have implemented PSS in their organization, and what the key success factors and issues that require special attention are (such as a focus on product availability for clients; an emphasis on diversity in terms of services provided rather than the range of products; and the need for staff to possess both knowledge of the product and relationship management skills). The reasons why PSS have nonetheless still not been widely implemented, particularly in the B2C context, seem to have already been explained fairly well in the literature available in 2006. For consumers, having control over things, artifacts, and life itself is one of the most valued attributes. PSS are often less accessible, or have less intangible value, than the competing product, in part because PSS usually do not allow consumers as much behavioral freedom or even leave them with the impression that the PSS provider could prescribe how they should behave.

1 INTRODUCTION

Product-service systems (PSS) are a specific type of value proposition that a business (network) offers to (or co-produces with) its clients. One definition of PSS is ‘*a mix of tangible products and intangible services designed and combined so that they are jointly capable of fulfilling final customer needs*’ (Tukker and Tischner, 2006a). From the mid-1990s, PSS became a popular subject for researchers engaged with sustainability and business alike.

This interest in PSS for environmental reasons has received a new boost from the recent revival of interest in resource-efficiency among important actors in civil society, business and government. With up to three billion people likely to join the global middle class by 2050 (WBCSD, 2009; McKinsey, 2011), competition for resources will inevitably grow. Improving the productivity of resources such as water and land by around a factor of two, and energy by a far higher factor, would make a substantial contribution to reducing resource depletion and the threat of climate change

¹ Short version of a review paper to be published in the Journal of Cleaner Production in a special issue on product-services. Available on line, <http://dx.doi.org/10.1016/j.jclepro.2013.11.049>

(McKinsey, 2011; BIOIS, 2012; Tukker, 2013). The European Union (EU) has therefore designated resource-efficiency as one of the flagships of its Europe 2020 strategy (EC, 2011). Influential authors from civil society and policy makers see PSS-like business models as one of the most important means of creating a 'lease society' (a term coined by Member of the European Parliament Judith Merkies (2012)), a circular economy (as championed by the Ellen McArthur Foundation (2013)) or simply a 'resource revolution' (McKinsey, 2011).

Given the promise held out by PSS, around 2000 a wave of major research projects started, mainly in Europe, where a few dozen major research institutes tried to develop a structure for classifying PSS. Their aim was to create a rigid scientific foundation for the concept and to learn from case studies when it would and would not work (e.g. Tukker, 2004). One of these projects was 'SusProNet', a network that served as one of the hubs in which PSS scientists could exchange experiences and views. At the end of that project, Tukker and Tischner wrote a review that was quite critical of sustainability-oriented PSS research (2006a and 2006b). The result of these shortcomings was that PSS was at that time a pre-paradigmatic field that still lacked clearly tested hypotheses and insights. Since then, attention to the PSS concept has deepened, particularly in the business research community. It therefore seems appropriate to follow up the reviews performed in 2004 and 2006 with a new paper that takes stock of developments since then and answers questions such as:

1. Is there a clear, uniform definition of the PSS concept?
2. Is there a clear, common approach to PSS development?
3. What do case studies and other scientific approaches tell us about
 - the conditions under which PSS contributes to sustainability?
 - the conditions under which PSS enhances competitiveness?

Are these insights more specific or do they reveal more than hypotheses formulated some eight to ten years ago (e.g. Mont, 2002 and 2004a; Halme et al., 2004; Tukker and Tischner (2006a; 2006b)? Can these insights help to determine whether PSS contribute to resource-efficiency, and to answer the main question addressed in this special issue: *'Why have sustainable Product-Service Systems not been widely implemented?'*

4. Is PSS now a consolidated science field with a clear paradigmatic concept and tried and tested research hypotheses?

2 THE PRODUCT-SERVICE LITERATURE SINCE THE LATE 1990s

Close to 300 papers were identified in Scopus, dealing with the PSS topic. For the way of selecting these papers I refer to the review forming the basis of this short paper (Tukker, 2013).

2.2 Analysis of references

It is interesting in and of itself to analyze some basic characteristics of the selected articles, such as year of publication, science field covered, the journal in which they appeared, etc. That analysis is provided below.

Figure 1 shows the number of papers published in each year. Over half of all the papers were published in 2010, 2011 and 2012. Figure 2 shows that environment is not (if it ever was) the main subject of papers on PSS.

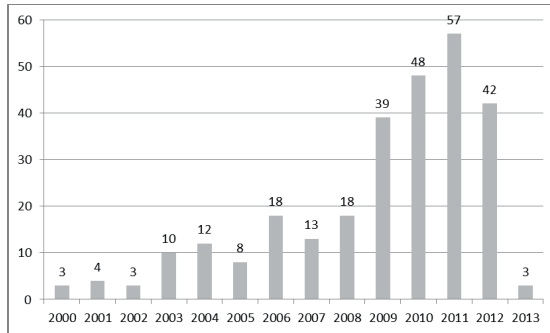


Figure 1: Number of papers per year of publication (status on 18 December 2012)

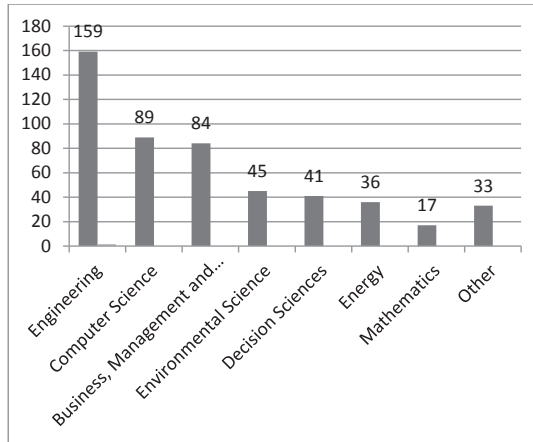


Figure 2: Number of papers per Scopus subject area (status on 18 December 2012; the same paper may cover more than one subject area)

Tables 1 and 2 give the numbers of papers by author and the top cited authors in the field.

Table 1: Top 15 authors ranked by number of PSS publications

(status on 18 December 2012)

	AUTHOR NAME	
1	Park, Y.	10
2	Sakao, T.	9
3	Roy, R.	9
4	Aurich, J.C.	8
5	Mont, O.	8
6	Geum, Y.	7
7	Jiang, P.	6
8	Sundin, E.	6
9	Shimomura, Y.	6
10	Schweitzer, E.	5
11	Lindahl, M.	5
12	Meier, H.	5
13	Evans, S.	5
14	Tiwari, A.	5
15	Lee, S.W.	4

Table 2: Top 20 papers by number of citations

(status on 18 December 2012)

Year	Authors	Document Title	Citations
2002	Mont O.K.	Clarifying the concept of product-service system	202
2007	Baines T.S., Lightfoot H.W., Evans S., et al.	State-of-the-art in product-service systems	187
2002	Menor L.J., Tatikonda M.V., Sampson S.E.	New service development: Areas for exploitation and exploration	165
2001	De Brentani U.	Innovative versus incremental new business services: Different keys for achieving success	141
2001	Dangayach G.S., Deshmukh S.G.	Manufacturing strategy Literature review and some issues	125
2001	Mathieu V.	Service strategies within the manufacturing sector: Benefits, costs and partnership	103
2004	Tukker A.	Eight types of product-service system: Eight ways to sustainability? Experiences from suspronet	99
2006	Aurich J.C., Fuchs C., Wagenknecht C.	Life cycle oriented design of technical Product-Service Systems	89
2008	Srivastava S.K.	Network design for reverse logistics	83
2004	Alonso-Rasgado T., Thompson G., Elfstrom B.-O.	The design of functional (total care) products	83
2003	Maxwell D., Van der Vorst R.	Developing sustainable products and services	82
2003	Manzini E., Vezzoli C.	A strategic design approach to develop	81

		sustainable product service systems: Examples taken from the 'environmentally friendly innovation' Italian prize	
2003	Brown S., Bessant J.	The manufacturing strategy-capabilities links in mass customisation and agile manufacturing - An exploratory study	75
2008	Basole R.C., Rouse W.B.	Complexity of service value networks: Conceptualization and empirical investigation	73
2005	Stevenson M., Hendry L.C., Kingsman B.G.	A review of production planning and control: The applicability of key concepts to the make-to-order industry	70
2006	Tukker A., Tischner U.	Product-services as a research field: past, present and future. Reflections from a decade of research	62
2000	Spring M., Dalrymple J.F.	Product customisation and manufacturing strategy	62
2006	Morelli N.	Developing new product service systems (PSS): methodologies and operational tools	58
2002	Van Der Aa W., Elfring T.	Realizing innovation in services	58
2000	Roy R.	Sustainable product-service systems	57

The most interesting conclusions from this concise analysis are probably the following. First, the clearly rising number of papers shows that the interest in the PSS concept was not a temporary phenomenon fuelled by a string of EU projects launched around 2000. Scientific output of PSS-related papers increased four- to five-fold in the decade between 2000 and 2010. This is a substantial increase, even correcting for the general trend that more papers are being published – the number of articles listed annually in Scopus doubled from roughly one million in 2000 to two million in 2010. Second, we see that the concept is probably even more firmly embedded in the engineering and business literature than in the environmental literature. Third, we see that whereas the PSS concept was born in Europe, it later clearly found a resonance particularly in Asian countries – all but four of the 41 Chinese papers and all but one of the 25 Korean papers date from 2009 or later. The detailed conclusions concerning authors with high numbers of publications in this paper, for example, differ slightly from those of Boehm and Thomas (2013) due to the different base set of papers used, as discussed earlier. The more overarching conclusions, however, do not differ fundamentally from what Boehm and Thomas (2013) found in their review.

3 PROGRESS IN INSIGHTS ABOUT PSS

3.1 Introduction

After this concise quantitative analysis of papers, we turn to contents. Reviewing a selection of the 278 papers that were inventoried, I want to analyze whether progressive insight has been acquired since around 2005 on the following subjects:

1. (further) specification of the PSS concept
2. (further) specification of the approach to PSS development
3. (novel) insights about the conditions under which
 - PSS contributes to sustainability

- PSS enhances competitiveness
4. whether PSS is now a consolidated science field with a clear paradigmatic concept and tried and tested research hypotheses.

3.2 The PSS concept

Literature from 2006 and earlier

As also noted by Baines et al. (2007), the definitions used in the formative years of the PSS field essentially refer to “product(s) and service(s) combined in a system to deliver required user functionality”. Most classifications make a distinction between three main categories of PSS (Tukker, 2004)²:

- The first category is product-oriented services. Here, the business model is still mainly geared towards selling products, but some additional services are added. Sub-categories are product-related services (e.g. insurance or maintenance contracts) and advice and consultancy.
- The second category is use-oriented services. Here, the traditional product still plays a central role, but the business model is not geared towards selling products. Ownership of the product remains with the provider, it is made available in a different form, and sometimes shared by a number of users. Sub-categories are product leasing (use by a single user), product renting or sharing (sequential use by different users) or product pooling (simultaneous use of the product by various users, e.g. car pooling).
- The final category is result-oriented services. Here, the client and provider agree in principle on a result, and there is no pre-determined product involved. Sub-categories are activity management/outsourcing (e.g. catering services), pay-per-service unit (e.g. payment per copy made in copying; per km driven in fleet management; or per airplane landing in tire management services), or functional result. As already mentioned, this type of PSS is the most promising in terms of facilitating a shift to a circular and resource-efficient economy, since the profit center is now the result delivered rather than the product sold. All material products and consumables used to deliver the result now become cost factors, creating an incentive to minimize their use.

Literature from 2006 and later

In more recent literature, authors sometimes still come up with their own definitions of PSS, although in most cases they do not differ fundamentally from the concepts defined in the period just after 2000. Examples are:

- An Integrated Product Service System (iPSS) “is a systematic package in which intangible services are attached to tangible products to finish various industrial activities in the whole product life cycle” (Zhang et al., 2012: 1579);

² Obviously, there are authors who use slightly different classifications. Komoto et al. (2005) do not mention the ‘product-oriented service’, but, in addition to the ‘Functional sales’ and ‘sharing’ models, distinguish a ‘Commercial’ model, which can probably best be described as ‘pure service’, and the ‘Traditional model’, in which they combine the ‘pure product’ and ‘product-oriented service’ models. Michelini and Razzoli (2004a) discern the provision of ‘tangibles’ (products and product-oriented services, or leased products) or ‘intangibles’ (sharing and pooling; function-oriented services), in essence following Hockerts and Weaver’s (2002) division according to who owns the property rights to the product.

- “Elements of PSS [are]: product, service, and supporting networks and infrastructure; Goals of PSS [are]: strives to be competitive; maximum customer value; lower environmental impact (Wang et al., 2011a and 2011b)”;
- “integrated service products (ISP) – in the product sales stage, to meet the clients’ multi-level needs, the manufacturer provides customers with “physical product plus service” service packs; whereas, physical product is the carrier of product service, and product services are function added and the value added for the physical product. However, since the ISP combines characteristics of both physical products and services, it becomes the most complex product type” (Li et al., 2012);
- By supplying an integrated bundle of hardware, software, and service elements, the customer problem is solved completely. These bundles are known as product service systems (PSS) or hybrid products (Berkovich et al., 2011).

There are some exceptions. For example, in a broad review of business modeling literature, including PSS, Lay et al. (2009) define eight parameters that differentiate the models: ownership during use and at end of life; financing; maintenance personnel; payment; number of customers; location of the operation; and retrieval and recycling. They then describe the options for providing each feature (for example, for ownership: the equipment producer, a leasing bank, an operating joint venture or the customer). This results in a morphological box that allows for a fine-grained characterization of product-service-like business models (see Figure 3). Boehm and Thomas (2013) adopted an interesting approach by making use of ‘definition graphs’ to analyze how words were linked together as defining elements for the PSS concept in the Information Systems, Business Management and Engineering and Design disciplines. This led them to propose that the following definition would be acceptable in every field: *‘A Product-Service System (PSS) is an integrated bundle of products and services which aims at creating customer utility and generating value.’* While on the surface not entirely different to earlier definitions, it rightly emphasizes that the combination of products and services needs to create utility for customers and value for providers. They do not offer a further sub-classification of PSS.

Characteristic Features		Options			
Ownership	during phase of use	Equipment producer	Leasing bank	Operating joint venture	Customer
	after phase of use	Equipment producer	Leasing bank	Operating joint venture	Customer
Personnel	Manufacturing	Equipment producer	Operating joint venture	Customer	
	Maintenance	Equipment producer	Operating joint venture	Customer	
Location of operation		Equipment producer's establishment	Establishment "fence to fence" to the customer	Customer's establishment	
Single / multiple customer operation		In parallel operation for multiple customers		Operation for a single customer	
Payment model		pay per unit	pay for availability	fixed rate	pay for equipment

Figure 3: Morphological box as developed by Lay et al. (2009) as a framework to describe new product-service oriented business concepts

3.3 PSS design methodologies

Literature from 2006 and earlier

In the period after 2000, a variety of guidelines for PSS development were produced. One of the most widely disseminated is UNEP's Design for Sustainability manual, which includes a PSS module (Crul et al., 2009)³. Other manuals from that time were the result of the Sustainable Product Development Network (SusProNet) project (Tukker and Tischner, 2006b – Annex 1), the Method Product Service Systems (MEPSS) project (van Halen et al., 2005), and many other initiatives (e.g. James et al., 2001; Morelli, 2006; Tukker and van Halen, 2003; Brezet et al., 2001; Manzini et al., 2004; Halme et al., 2004; Maxwell and van der Vorst, 2003). The SusProNet project made a cross-analysis of most of the methods available around 2006, which showed that although the steps in the methods differed somewhat, they could be clearly grouped into three main blocks (Tukker and Tischner, 2006b):

1. Analysis: assessment of strengths and weaknesses of the current product portfolio and markets, decision making in priority areas where PSS development could be beneficial for client and firm;
2. Idea generation, selection, refinement and evaluation (finding ideas, selecting the most promising ones, and detailed design)⁴;
3. (Planning and preparing) implementation.

The methods described above are usually supported by dedicated tools and worksheets on aspects such as idea generation and creativity enhancement; economic, social and environmental evaluation; visualization of the PSS in the form of a storyboard; and description of the PSS business model in terms of technical architecture, organizational architecture, and revenue streams, including the need for setting up new partnerships to deliver the PSS ('make or buy' decisions)⁵. Figure 4 gives a summary of the PSS development method suggested by the UNEP manual (Crul et al., 2009).

Figure 4: Suggested steps and tools in PSS development (taken with permission from the UNEP publication 'Design for sustainability – A step by step approach'; Crul et al., 2009: 101)

³ While only published in 2009, this manual was in preparation for a long time and in fact represents the design approach for PSS developed in the period up to 2006 – most authors of that manual were in fact involved in or drew upon the string of EU projects relating to PSS that were concluded around 2005.

⁴ Various authors suggest using the TRIZ methodology as a basis for PSS idea generation (e.g. Low et al., 2000; Chai et al., 2005; for later work see Rovida et al., 2009; Kim and Yoon, 2012). TRIZ is the theory of inventive problem solving developed by Altshuller and colleagues after the Second World War. The hypothesis behind TRIZ, which is substantiated by meta-analyses of innovative processes, is that there are around 40 key universal principles that lie behind all creative innovation. It is postulated that by using these principles in brainstorming and creativity processes for solving a specific problem, a comprehensive set of new solutions can be found (Kim and Yoon, 2012).

⁵ These approaches have a lot in common with New Service Design methodologies, as described for instance by Menor et al. (2002). They also describe a gate-stage process of design (strategy formulation, idea generation and screening and concept development), analysis (detailed analysis of the business case and authorization), development and full launch.

Steps in the pilot project	Suggested tools
1. Exploring opportunities: identification and analysis of the existing reference system	<ul style="list-style-type: none"> - Drawing a system map/ Blueprinting - Sustainability SWOT - Checklist for analysing existing reference system
2. PSS idea generation and selection of the most promising concepts	<ul style="list-style-type: none"> - Sustainability Guidelines Level 1 - Format of PSS concept description - PSS Sustainability Screening Tool - Portfolio Diagram Sustainability and Feasibility
3. Detailing selected PSS concepts or PSS design	<ul style="list-style-type: none"> - Sustainability Guidelines level 2 - Extended system map of the new system/ blueprint - Extended description of the new system - First Advertisement for the new system
4. Evaluation of the detailed concepts and testing if possible	<ul style="list-style-type: none"> - Three Sustainability Radars for the three sustainability dimensions with six criteria each
5. Planning implementation	<ul style="list-style-type: none"> - List of specifications for PSS implementation - Business plan for new PSS

Literature from 2006 and later

The literature published in 2006 and later reveals no shortage of PSS design methods. Recent reviews include Aurich et al. (2010), McAloone (2011), Sakao and McAloone (2011) and Vasantha et al. (2012). Some papers focus on specific methods and tools to be used within a design procedure. Papers describing an integrated PSS development trajectory include the following.

- Like most of the aforementioned authors, Aurich et al. (2006a) propose a step-by-step process. They essentially translate the traditional process of product design involving idea finding, concept development, product construction, product detailing, prototype development, and manufacturing preparation into a process of technical service design involving demand identification, feasibility analysis, concept development, service modeling, realization/planning and service testing, and propose a parallel, interactive process of product and service development for PSS.
- Aurich et al. (2006b) and others (e.g. Wang et al., 2011a; Li et al., 2012) further emphasize the relevance of a modular design of product and service development. The modules would consist of the phases in product and service design already mentioned above, as well as a set of standardized tasks to be executed in each phase. This modularity would have the advantage of enhancing the speed of new PSS development, allowing for new and unexpected PSS combinations without major design and testing needs, hence mitigating the potential high costs of customization of offerings, etc.
- Geng et al. (2011, 2010a, 2010b) suggest yet another PSS design method, emphasizing a formal and quantified assessment of customer requirements (CRs) and engineering characteristics (ECs), using a non-linear optimization approach to decide systematically how levels of product ECs and service ECs in combination maximize fulfillment of customer requirements.
- Clayton et al. (2012) performed a single in-depth exploratory case study of PSS design, which showed that various feedback loops occur in the design process and that it is cyclical and iterative. They interpreted this as deviating from what they perceived as the rather linear approaches in PSS design literature. Pezzotta et al. (2012) therefore suggest a 'spiral' approach to PSS development that has a few iterations in the design process, which leads via various initial attempts to an operational prototype PSS.

- Akasaka et al. (2012) provide a highly formalized PSS design methodology based on research from the field of service engineering. Customer requirements are identified in a highly formal way and PSS designs that meet the requirements are then developed with the help of a Service Design Catalogue. The method still lacks an evaluation phase for the generated solutions.

Compared with the pre-2006 literature, essentially this work emphasizes interaction between design of product and service components, design of modular components that can be easily combined to form different PSS, the non-linear and trial-and-error nature of PSS design, and has developed a host of innovative and sophisticated tools that could support PSS design, for instance with regard to ex-ante customer satisfaction and cost assessments. All these innovations fit in well with the general scheme outlined in Figure 4. Some authors question whether this means PSS design is now mature. Viaantha et al. (2012) evaluated the maturity of eight archetypical PSS design methods with regard to twenty aspects. Among other things, their review suggests a lack of attention to detailed requirement lists, design of the business model in conjunction with the product-service, tools supportive to sustainability, the organization of co-creation processes, and the relevance of differences between domains (B2B, B2C and B2G) and types of PSS in the design process. They also noted important differences in terminology in PSS design methods. Finally, they advocated more on-the-ground evaluations of PSS design in industry⁶. It further seems that design methods aimed at improving competitiveness currently dominate, which might explain the lack of explicit attention to sustainability. Contributions to resource-efficiency will obviously then only occur because the business incentives related to PSS (and result-oriented PSS in particular) foster low material use, rather than the fact that the design process is focused on identifying sustainability opportunities per se.

Probably the most interesting contribution of the post-2006 literature is that it focused not only on PSS development per se, but also on the capability development challenge and transformation processes that firms have to deal with to achieve market success with PSS. Such analyses have been performed mainly for B2B manufacturing firms. As the next section also illustrates, this is probably one of the key success and failure factors (see also Cavalieri and Pezzotta (2012); Ryan et al. (2011)). Alix and Vallespir (2010) are among those who have addressed the issue of company fit and integration. They provide a toolbox for evaluating how the requirements for PSS relate to the core competences, processes and environment of a manufacturing firm. Tan et al (2010, cf. 2007) also reviewed strategies for designing and developing services for manufacturing firms. In two case studies they found that the systematic design methods offered by literature could not be followed directly – the two firms concerned found they had to establish independent customer-oriented organizations so that there was no negative interaction with existing (product-oriented) businesses and actors in the market. An alternative for this identified by other authors is to team up with another firm that is responsible for providing the service component. Hence, various authors focus on methods of partner selection and building and evaluating collaborative networks (Zhang et al., 2012; Sun, 2010), which is only the first step in establishing a properly functioning PSS supply chain in which all the partners share relevant information, have aligned incentives, and experience balanced benefits (Lockett et al., 2011).

⁶ The improvements suggested by Vasantha et al. (2012) would probably lead to much more refined and differentiated methodologies at a much higher level of granularity and detail than those currently depicted in literature. This has pros and cons. The pro is that more tailor-made methods will become available. The con is that at some point each firm will appear so unique that generic methods always have to become tailor-made, and that hence the main question is whether or not generic schemes like the UNEP manual cover the most important aspects in PSS design and help managers in firms to develop their own, more detailed procedures.

3.5 Business and environmental (dis)advantages of PSS

Literature from 2006 and earlier

In our reviews from 2004 and 2006 (Tukker, 2004; Tukker and Tischner, 2006a) we used Stewart's concept of Economic Added Value (1991) to identify crucial elements determining the business advantages and disadvantages of PSS. We based our reviews on the simple assumption that the aim of business is to remain profitable for a sustained period of time. I list those elements below, where relevant enriching the analysis with other references from the period up to 2006:

1. Market value of the PSS compared to the competing product. In this context, it is essential to distinguish between tangible and intangible value. Tangible added value consists of the resources, time input and cost of capital that the user saves compared with using a product-based solution. PSS are indeed often cheaper for the user in a traditional sense. Intangible added value relates to 'priceless' experiences, brand value, sense of control, ease of access, etc. and is often forgotten in a comparison between PSS and product⁷. In this respect, many PSS, particularly in the B2C area, score worse than the competing product solution – car or washing machine ownership has intangible added value in terms of self-esteem, access, etc.
2. Production costs of the PSS compared to the competing product. These include traditional costs such as the input of resources and labor required to create the PSS. However, PSS often involve additional cost items that product manufacturers are less familiar with. An example is transaction costs, since a PSS is usually delivered by a group of companies, resulting in more complicated contracting and revenue-sharing schemes. And PSS producers suddenly assume greater responsibility for delivering a result for a considerable time for a pre-agreed price; if there are cost factors that are unknown and cannot be influenced over time, this can generate a significant cost risk that does not arise in a simple product sales model.
3. Investment needs/capital needs for PSS production. This consists of two factors. First, a PSS provider often has to finance the capital costs of the solution (e.g. a leased car) and is paid back in installments. But second, and probably more importantly, most companies start out with experience as purely a product or a service provider and need either to develop or buy in entirely new competences and capabilities. On top of this, the PSS business may need new delivery and supply channels and production practices that could compete with the existing product sales business, leading to depreciation of capital and goodwill.
4. The ability to capture the value present in the value chain, now and in the future. Often, PSS helps a business to establish a more strategic position in the value network, enabling it to capture more value. Since the relationship with the client is not confined to the moment the product is sold, but is a more sustained relationship, PSS typically lead to higher client loyalty

⁷ For instance, in the strictly function-oriented approach of Life Cycle Assessment, which compares the environmental impacts between products providing the same functionality. Many LCAs see the functionality of cardboard packaging as equal to that of glass packaging, whereas for wine drinkers it is clear that drinking from a bottle provides a much better experience than drinking the same wine packed in a carton and hence they do not provide the same intangible functionality. Komoto et al. (2005) provide an interesting simulation of the life cycle costs of washing in different service provision scenarios (machine owned by the user; 'pay per wash' functional sales with the machine placed at the user; shared use of a machine between households; and outsourcing washing to a commercial provider. But they also flag that these options have quite different 'experiences' or 'intangible' value – the commercial model, for instance, implies a need for better planning of when to have clothes washed. It is essential to take these less quantifiable value aspects into account. Mont (2004b) also found similar trade-offs between costs, environmental impacts, and consumer experience in evaluating PSS for lawnmowers and drills, where in her cases the environmental benefits of the PSS prevailed.

and more dedicated and unique knowledge about clients and consequently, greater potential to innovate.

As for environmental benefits, our own review and others from that period showed a mixed potential (Tukker, 2004; Tukker and Tischner, 2006b).

- Product-oriented services would leave the system largely as is and would at best produce some environmental gains through better maintenance, which might lead to optimal energy and resource use in the use stage, for example. However, the business incentive is still to sell as many products as possible, and limited improvements of resource-efficiency could be expected. Indeed, manufacturers might have the incentive to create ‘built-in obsolescence’ in order to sell replacement products sooner (Slade, 2007).
- Use-oriented services were found to constitute a mixed bag. Leasing often leads to less careful behavior by the user since he or she no longer owns the product, probably leading to higher impacts. Product renting and sharing, and particularly pooling, have significant benefits, however, since the capital goods are used more intensively, and, in the case of pooling, impacts in the use stages are shared by more than one user. Heiskanen and Jalas (2003) show, for instance, that car sharing reduces impacts by 30% to 50%, as do ski rental services. Drilling rental services can reduce impacts by as much as a factor of 10. Laundry services would be up to 50% more energy and water efficient.
- Result-oriented services, finally, would in theory have the greatest potential for environmental improvement, since solutions could be offered that are based on approaches that are entirely different to the existing product concept. In result-oriented business models, the use of materials also becomes merely a cost factor – using more materials or creating more products does not lead to increased revenues. Hence, in principle there is an incentive to reduce the costs of materials by using fewer, using them longer, etc. Such gains are not a given, however – for instance, outsourcing of catering while still offering the same menu will at best yield limited improvements in terms of efficiency gains.

In essence, one cannot therefore expect product-oriented PSS to provide a radical boost in terms of resource-efficiency or a circular economy. The potential for use-oriented and result-oriented PSS is higher, but here we see in various case studies that diffusion of PSS on the market may be hindered due to the problems described above.

Literature from 2006 and later

The literature addressing the advantages of PSS for business and in terms of sustainability since 2006 consists of case studies, sector reviews, and more comprehensive reviews of PSS performance. It has to be said, however, that as in the pre-2006 period, case studies and qualitative assessments dominate. Research methods like surveys, statistical data analyses, and meta-reviews analyzing quantitative data from case studies are still very rare, although they are needed to gain a quantitative insight into the sustainability and business benefits of different PSS at societal level. Some relevant case-study and sector-level contributions to the body of knowledge from this literature include the following.

- Halme et al. (2006) evaluated 200 potential ‘home services’, i.e. PSS related to the home. They found that many would in principle be cheaper and comfortable but nevertheless did not appear to have been widely implemented. They mention various factors hindering their diffusion: particularly for consumers, ownership adds to the intangible added value; firms often have no interest in changing to a PSS-like business model since a) it requires an entirely

different skill set and business chain and b) it requires a total redesign of the business model, probably an early write-off of production equipment (since product life will be extended or products will be used more intensively), etc. They also did not find a clear reduction of material intensity with a switch to PSS.

- Williams (2007) gives an example of the introduction of PSS in the automotive industry. His analysis confirms that particularly use-oriented and function-oriented PSS require significant changes in ownership structure, infrastructure and institutional context. There are therefore likely to be significant barriers to implementing such PSS.
- Devisscher and Mont (2008) showed that shared use of equipment by smallholder coffee producers in Bolivia in a cooperative set up resulted in significant economic and environmental advantages. Via shared use more efficient equipment became affordable, leading to better coffee quality, market opportunities and income. It led to time savings in production and reduction of intensive labor, as well as more professional management of solid and liquid waste flows. Barriers included capital availability for the cooperative, a relatively old and inflexible population running the individual farms, and the fact that the members of the cooperative were not obliged to trade via the cooperative.
- Kuo (2011) presented an interesting case study concerning a company in Taiwan that provides document equipment, solutions and services, with copying equipment playing a central role. It found that a major advantage of a procurement model over a rental model was lower system costs due to the fact that the customer who owns a product uses it more carefully.

While the post-2006 literature may have produced some more refined frameworks for evaluating sustainability and competitiveness (e.g. Roy and Cheruvu, 2009), this more recent literature seems to confirm the findings of the pre-2006 literature. The examples above confirm that product-oriented and use-oriented PSS, in particular, are not by definition more resource-efficient than business models based on product sales, as reflected by the statements of Haapala et al. (2008) regarding the removal of off-lease products from the market and Kuo (2011) on the less careful user behavior when products are leased and rented. Furthermore, PSS can have benefits for businesses or consumers, but certainly not in every instance. Various examples confirm the significant difference between business-to-business and business-to-consumer markets – consumers appreciate ownership and control (Halme et al., 2006), possessing new, ‘in fashion’ products (Intlekofer et al., 2010), and easy access to the product (Williams, 2007).

In sum, it has to be concluded that PSS will not by definition be more resource-efficient or ‘circular’ than product systems – result-oriented PSS offering the greatest prospect of radical resource-efficiency gains. Nor will PSS by definition be a business success, so companies that perform best in identifying those cases where PSS has added value and how it can best be implemented will be most successful. Other firms will either miss interesting business opportunities or bet on the wrong PSS in the wrong markets and develop them via sub-optimal processes.

4 Conclusions: progress in the PSS field and reflection on the theme of this special issue

To conclude, we see that research in the field of PSS is progressing well. The number of papers published annually has more than quadrupled in the last decade, whereas the number of scientific publications in general has only doubled. Where research labeled as PSS started out in Europe, it is now clearly embedded in the research infrastructure in a number of Asian countries. PSS is a subject that is now also discussed in a variety of research fields, i.e. as well as researchers interested mainly in sustainable design, also by researchers involved in engineering design, business management and information systems. Obviously, this has made the field more complex, since these communities each tend to have their own focus and vocabulary, but at the same time it ensures that the topic of PSS is now researched from different perspectives and that there is less chance of ‘blind spots’ occurring⁸. Most reviews now tend to contain analyses embracing the whole range of disciplines (e.g. Boehm and Thomas, 2013).

As for research into the concept of PSS, PSS development methods, and the economic and environmental potential of PSS, the body of research since the reviews performed around 2006 has clearly contributed additional insights. It seems, however, that progress, and the remaining research needs, differ depending on the topic:

1. PSS conceptualization and terminology. The literature since 2006 has clearly come up with more refined definitions, sub-classifications, and dimensions that characterize PSS (e.g. Lay et al., 2009). It is telling, however, that the highly formalized and strongly analytical approach taken by Boehm and Thomas (2013) to assess the common ground across most definitions led to the following proposal: *‘A Product-Service System (PSS) is an integrated bundle of products and services which aims at creating customer utility and generating value’*. It is of course valuable that a quantitative method was used to identify this definition as the best common ground in the scientific literature. Yet, it is also clear that this definition scarcely differs from those developed before 2006, which suggests that at a general level the conceptualization of PSS had already become quite mature by then. The same can probably not be said of the more detailed terminology and vocabulary used within the PSS community, however. Vasantha et al. (2012) discerned a clear need to define a common ontology for aspects such as characteristics of requirements, product services, stakeholders, (steps in the) design processes, life-cycle stages, outcomes, business models and support systems. This is probably not so much a question of doing more research but rather embarking on a standardization process in the PSS community.
2. PSS design methodologies. Here too we see that the literature after 2006 managed to refine and specify the methodologies that had already been developed before 2006, still largely following the (apparently robust) existing framework of analysis / idea generation, selection and refining / and implementation. Important new suggestions include proposals to accelerate PSS development and make them more versatile by using a modular design approach (e.g. Aurich et al., 2006b), as well as a host of suggestions for specific tools that could be used (such as applying requirement engineering, various economic optimization techniques, technology roadmapping to understand PSS development over time, and the use of information feedback systems enabling or informing PSS design). Some authors claim, however, that integration of such tools in the main detailed PSS design methods that are available is not yet mature or that tools are still lacking, potentially leading to a lack of emphasis on requirements that should drive PSS design, how to organize co-creation processes, sustainability opportunities, and the relevance of differences between domains

⁸ such as the finding of Tukker and Tischner (2006b) that the PSS concept as it developed within the sustainable design community before 2006 took hardly any notice of the quite relevant literature on business modeling.

(B2B, B2C and B2G) and types of PSS in the design process. This, together with more on the ground experimentation and evaluation of PSS design in different industries, should form the research agenda moving knowledge on PSS design forward. The most important contribution of the post-2006 literature is probably the strong attention to what PSS development means for a company's structure, culture, capabilities and management. Examples are a focus on product availability for clients rather than product production; an emphasis on diversification through services rather than product ranges; and the need for staff to possess both product knowledge and relation management skills. This, probably much more than having a sound design method, is currently the key success factor, particularly for product-oriented companies that want to put PSS on the market (cf. Baines et al, 2007; 2009a).

3. Business and environmental (dis)advantages of PSS. Here, recent literature – mainly case study research – simply seems to confirm the findings of the pre-2006 literature and the framework presented in section 3.5. PSS is not the sustainability panacea. Renting, leasing and sharing can have environmental benefits since, in principle, the same service level can be achieved with the use of fewer artifacts. However, leased products tend to be used less carefully than products that are owned, and rented, leased or shared products may be returned earlier to the service provider in comparison to the life time of a product sold in the traditional manner. Furthermore, the added value of PSS in terms of comfort, convenience and the experience of ownership, particularly in a B2C context, might be lower than that of a corresponding product. Consumers simply value owning things and having control over artifacts, issues that seem less relevant in a B2B context. For some firms, the costs of the transition from product-oriented to PSS-oriented can be prohibitive, particularly for result-oriented PSS requiring a totally different skill set and organization than in the case of product sales. Due to the high labor intensity, PSS can be more expensive than having a product operated by a consumer. High speeds of innovation make re-use impossible and undermine the economic potential of taking back products or components under leasing or pay-per-unit-use contracts. It is striking, however, that quantitative research methods like surveys, statistical data analyses, and even meta-reviews analyzing quantitative data from case studies are still rarely applied. Such research is recommended for the future, since it is essential to have a quantified and detailed understanding of the economic and other benefits of different PSS in different markets for competitiveness and sustainability.

This last point, then, also provides an answer to two key questions that play a central role in this paper. The first question is to what extent sustainable PSS can contribute to resource-efficiency and a circular economy. Product-oriented PSS do not change the incentive to maximize product sales. Use-oriented PSS potentially intensify the use of material products and hence could reduce the need for materials, but a possible drawback is that they could prompt less careful use, leading to quicker wear and tear. Result-oriented PSS have the greatest potential and provide an incentive to reduce material costs but require the most radical change in the business model compared with product sales, which hampers their broad implementation and hence real contributions to resource-efficiency and circularity⁹. This then leads to the second question, related to level of diffusion, which plays the central role in this special issue: *‘Why have sustainable Product-Service Systems not been widely implemented?’* In our view, the answer simply remains the same as the one given around 2006. Certainly, in various cases PSS can provide higher tangible and intangible value to the user, can be created with lower system costs, and can improve a firm's position in the value chain – and hence its competitive advantage. However, as we already concluded in 2006 (Tukker and Tischner, 2006a):

⁹ As indicated, this finding does not differ from the pre-2006 literature.

“However, PSS do not deliver such bonuses by definition. Particularly in a B2C context, product ownership contributes highly to esteem and hence intangible value. Access to the product is [in PSS] often more difficult, creating tangible consumer sacrifices. Costs can be higher, if the PSS has to be produced with higher priced labour or materials, or when the often more networked production systems generate high transaction costs. And sometimes a switch to PSS may weaken the position in the value chain. In industries where excellence in product manufacturing and design form the key to uniqueness and hence power in the value network, diverting focus to an issue such as PSS development is a recipe to lose rather than win the innovation battle.”

Supportive policies may be able to help diffusion of PSS (e.g. Ceschin and Vezzoli, 2010), but this is unlikely to be a productive way forward if customer experience of PSS is truly much lower than for the competing product. Conversely, stimulating wider diffusion of PSS would be supported by designs that enhance rather than limit customer experience and, from the firm’s perspective, by improved insights into how the risks from a transition from a product-centered firm to a PSS-centered firm can best be managed. It is indeed on this point (number 2 in the list above) that most progress has been made in the PSS literature since 2006. This seems pivotal for realizing a true circular economy and/or a resource revolution via the implementation of PSS.

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SERVICE INFUSION IN PRODUCT-ORIENTED COMPANIES

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ABSTRACT

This article uses bibliographic methods to explore the structure of the research domain on service infusion in product-oriented companies, to better understand its origins, current state of development, and future directions. We highlight the three phases in the emergence of the research topic, identify dominating theoretical perspectives and empirical approaches, and highlight seven research directions within the research domain. We develop a future research agenda help managers to identify key questions when shifting the strategic focus of their firms from products to services and combinations of products and services.

1 INTRODUCTION

Service infusion in product-oriented companies has become one of the most active research areas in the service domain (Ostrom et al. 2010). The basic proposition is that traditional product-oriented companies shift much of their attention from designing, manufacturing, and selling products towards innovating, selling, and delivering services (Davies 2004, Oliva and Kallenberg 2003, Gebauer et al. 2010, Tukker 2002, Ulaga and Reinartz 2012). The services themselves and/or products and services are combined into customer-specific solutions, in which the value contribution in terms of revenue, profit, and customer satisfaction are increasingly attributed to services.

There has been a sharp rise in academic contributions. Publication rate on services in product-oriented companies has reached about 100 articles per year. Managers have become advocates for service business development and have led firms to strong service business growth. Service revenues and profits account for nearly 50% of the total revenues now.

One might surmise that there exists a common theoretical perspective and comprehensive empirical data. This is still far from the case. The description of product-oriented companies making a strategic reorientation into service infusion remains open to a variety of conceptualizations. Varying descriptors such as hybrid offerings, solution providers, transition from products to services, system suppliers, product-service systems, and servitization are used to characterize the phenomena. While such variations have contributed to the richness of the service research in product-oriented companies, they also constrain progress on the theoretical front and prevent empirical work from cumulating. Some of the vital theoretical and empirical issues, which might resolve themselves in time as service infusion as a research domain evolves. However, it could be risky to form an elusive research frontier. Yet, we believe it would be useful to structure the research contributions and to explore how the research domain is taking shape.

2 BIBLIOGRAPHIC METHODS

Bibliographic methods have been successfully used for uncovering and articulating structures of research domains. We applied the bibliographic methods in the following steps. First, we considered Scopus as most suitable database compared to alternatives such as the Web of Science or Google Scholar. The Web of Science database contains fewer journals and conference proceedings than Scopus. Google Scholar has no advanced search function and does not offer unique identification numbers for the articles.

Second, we searched titles, abstracts, or keywords containing expressions capturing different conceptualizations (e.g. “service infusion”, “product-service-systems”, “transition products to services”, “solution providers”, “service business development”, “servitization”, “after-sales service” and “system suppliers”), which are related to the overall topic of product-oriented companies moving towards services. The search results were merged into a master list of articles. In the process, we checked for double entries and inconsistencies such as misspelled names or wrong publication years. These methods yielded 931 articles.

Third, two independent judges evaluated these articles according to their contribution to service infusion in product-oriented firms. After estimating the number of judgments for which agreement was expected by chance, we calculated Cohen’s kappa, an indicator of interjudge reliability as 0.82. The evaluation yielded a set of 676 contributions published between 1987 and 2012. Fourth, we analyzed these contributions in terms of tracking the number of articles published per year, the journals, subject areas, key words, and countries of origin of the researchers.

Fifth, we conducted a citation analysis of these 676 articles. Citation numbers are accept-able surrogates for identifying the intellectual core of the service infusion (Culnan 1986). We selected those articles with 25 and more citations.

Sixth, we conducted a second descriptive analysis for the intellectual core. We analyzed all core articles according to empirical and theoretical perspectives. We coded the empirical data into the following categories: (i) research papers versus management articles, (ii) conceptual versus empirical papers, (iii) quantitative versus qualitative, (iv) data collection methods (e. g., interviews, observations, or action research), (v) time frame for data collection, (vi) unit of analysis (company, supplier-buyer relationship, or customers), and (vii) industry focus.

Seventh, we applied co-citation analysis to these articles in order to reveal the research structure. We used a relative co-citation value (CoCit) as the measure of similarity of two articles. The relative co-citation matrix is transformed into a correlation matrix using the Salton’s Cosine Measure. This measure makes it possible to standardize the data and reduce the number of zeros in the co-citation matrix (Leydesdorff, 2005). The resulting correlation matrix is the starting point for identifying the structure of the research field.

Eighth, we applied multidimensional scaling (MDS) and factor analysis. We assumed that the potential research topics are not fully independent from each other. We use a Varimax rotation with the results of the principal component analysis (PCA). Factor analysis classifies the articles into related sets, called factors, by detecting structure on the basis of varying degrees of relatedness among the articles. The factors comprise relatively homogenous groupings of articles that may represent a specific research direction. Two independent judges, who each evaluated whether or not specific articles belong to one identified research direction, assessed the reliability of the article groupings.

The factor analysis is preceded by a MDS analysis. The MDS maps the proximity among the articles comprising the intellectual core. The position of each article on the map depends on its relationship to the other articles in the intellectual core. We develop a content-based interpretation for the axis in the map based on the position of the factors on the map and by an examination of the topical concerns of the articles along the axes.

3 RESULTS

The whole set of 676 articles has been published in 159 different journals ranging across different management disciplines. Specifically, Industrial Marketing Management (8.3%), Journal of Business and Industrial Marketing (5.0%), Journal of Service Management (3.5%) and Journal of Manufacturing Technology Management (3.5%) play a vital role in disseminating the research.

European contributions dominate service infusion research. Even if the United States (15.9%) has the highest percentage as a country, the European countries together account for 61.6% of the total contributions. Service infusion becomes also more and more important among scholars from China (6.2%), Australia (2.2%), South Korea (1.8%), Taiwan (1.9%) and Japan (1.3%).

Analyzing the number and content of articles suggest that two tipping points divide the evolution of the research topic into three phases. Phase 1 starts with the earliest contribution in 1987 and continues until 1999. Even if the number of journals and the electronic records might be limited in the late 80s and the 90s, there is still strong evidence that publication rate remains relatively low in Phase 1. It can be best described as embedding service infusion into business-to-business marketing. Phase 2 starts around 2000 and ends about 2009. During these years, service infusion research developed into a highly dynamic and high impact field. Key concepts such as product-service systems and integrated solutions, transition from products to services, and service business development inspired the research domain (Tukker 2004, Davies 2004, Oliva and Kallenberg 2003, Mathieu 2001a, Gebauer et al. 2005). Phase 3 started in 2010. Since 2010, contributions seem to reach about 100 annually suggesting that the research domain has reached a first maturity level. Phase 3 still puts strong emphasis on the abovementioned key concepts. Additionally, topics such as business model innovation, service and product innovation, and competitive advantages through services (Gebauer et al. 2011) seem now to move towards a main research focus.

Applying our threshold of 25 citation leads to a core set of the 55 most influential contributions ("Intellectual core of service infusion in product-oriented companies"). This core is informed by a relatively high percentage of management papers (15.9%) indicating the strong managerial interest in the research topic. These papers are published in most prominent management journals such as Harvard Business Review and Sloan Management Review. The remaining 84.1% are research papers, which are dominated by empirical studies (63.6%). Conceptual papers (18.2%) and one literature review (2.3%) have played only a minor role until now. Empirical studies are mostly qualitative (45.4%) obtained through interviews. 18.2% of the intellectual core are quantitative studies.

There are only a few longitudinal studies. Neu and Brown (2008) study the attempt of a single information technology manufacturer to move toward services over the period of about one and a half year. A few other studies (Davies 2004, Davies et al. 2006, Matthyssens and Vandembemt 2008) cover the period of five to eight years. The majority of the contributions are snapshots of the service infusion process. Intervened with the shortage of longitudinal studies is a lack of evidence of service-related performance outcomes. The five case studies provided by Davies (2004), for example, do not describe changes in financial service performance (service revenues and service profits) and non-financial service performance (customer satisfaction and loyalty). The comparative case studies investigating companies achieving high and low shares of service revenues are a rare exception. Qualitative studies do often not report service performance outcomes and are also silent on overall company performance. Quantitative studies provide more detailed evidence on service and company performance.

The intellectual core is dominated by studies of the capital goods manufacturing industries. Interestingly, there are also studies from the micro-electronic industry (Mathieu 2001b), pure technical service providers, industrial wholesalers and dealers (Matthyssens and Vandembemt 1998), electrical and mechanical engineering industry, metalware industry (Homburg et al. 2003), and information technology providers (Neu and Brown 2005).

Though theoretically based studies are infrequent, relationship marketing and strategy approaches seem to be the most prominent conceptualizations. Tuli et al. (2007) view customized solutions not only as a combination of goods and services, but as a set of customer-supplier relational processes comprising (1) customer requirements definition, (2) customization and integration of goods and/or services and (3) their deployment, and (4) post-deployment customer support, all of which are aimed at meeting customers' business needs. Penttinen and Palmer (2007) combine the nature of supplier-buyer relationship (transaction-based and relationship-based) with the total offerings. Strategy approaches contain different types of service strategies or, in other words, product-service systems (Mathieu 2001a, Gebauer et al., 2010, Tukker, 2004). Service strategies are operationalized through the actual service offerings. Product-service-systems contain the value created by the service content such as use-oriented and result-oriented product-service systems, which are built around pay per service unit, renting, pooling, and leasing services. Very few studies use more fundamental

management theories such as contingency-theory (Neu and Brown 2005, Gebauer et al. 2010), the resource-based view (Fang et al. 2008), or service-dominant logic informing the solution marketing contributions (Cove and Salle 2008).

The initial PCA indicated that 8 out of 55 articles have factor loadings of less than 0.4 and were eliminated. The final PCA resulted in the extraction of seven factors, explaining 82.3% of the variance. Table 2 shows the factor loadings (McCain 1990). Loading of an article of more than 0.7 indicates them as a primary factor. Loadings of an article from 0.4 to 0.7 indicate that it is related secondarily to additional factors. To characterize the factors as distinctive research directions, we examined the set of contributions loading primarily on each factor for common themes. Based on these themes, the research directions can be categorized as: (i) solutions delivery, (ii) solution marketing, (iii) service business performance, (iv) services in manufacturing, (v) prod-uct-service systems, (vi) servitization, and (vii) service development.

MDS precedes the factor analysis. The content-based interpretation suggests that x-axis juxtaposes the value chain starting the upstream suppliers, the actual product-oriented companies become more service oriented, and ending at the customers purchasing the services. At one ex-treme, the x-axis contains a downstream, or customer perspective, focusing on matters such as the value proposition of the services or relational processes with customer. A typical illustration is Tuli's et al. (2007) description of customer-supplier relational processes. At the other extreme, the x-axis contains an upstream, or supplier perspective concerned with the service delivery. Davies et al. (2006) distinction into system integrator or system supplier is positioned on that extreme of the x-axis. System integrators are argued to rely on partners for delivering solutions, whereas system suppliers deliver customized solutions themselves. The majority of articles is clustered around the centre. It means that most contributions conceptualize service infusion from the perspective of a single firm attempting to develop a service business.

The y-axis represents a continuum going from highly strategic focus, with a stronger explanation of role of service strategies (e.g. Gebauer et al. 2010, Mathieu 2001a), to an operational focus, with more attention to individual competences or management approaches. Individual competences refer to the behavioral attitudes and service knowledge associated with moving from products to services (Gebauer and Friedli 2005). Management approaches cover key issues such as new service development processes (Brentani 1989) or service pricing (Malleret 2006). Articles describing typical antecedents such as corporate culture and organizational structures for the service business build the centre of the y-axis.

4 DISCUSSION

Our results reveal critical empirical and theoretical concerns and shed light on some of the difficult yet crucial questions posed by service infusion research.

Empirically, there seem to be at least two recommendations for future research efforts. First, there are strong needs for more longitudinal studies. Longitudinal empirical designs would be more in line with the actual basis argument that service infusion is a long-term, often incremental process (Brax 2005, Neu and Brown 2005). A stronger long-term perspective would shift the research attention from investigating companies, which are argued to have successfully moved towards services to the actual service infusion process including investigating failures, necessary investments, emerging risks, and critical incidents.

Second, intertwined with a stronger long-term perspective and emphasis on failed service infusion activities is the empirical concern on more valid service performance measures. More valid service performance measures means that research should try to report changes in financial and non-financial service performance measures. Financial performance measures should include service revenues and service profitability, where, of course, the latter are arguably difficult to obtain and sometimes confidential. Nevertheless, researchers should track service revenues in order to validate the argument that product-oriented firms actually attempt to increase and maximize the share of service revenue on firms' total revenue. To deepen the understanding of service revenues and profitability, researchers should gain more knowledge on the role of indicators such as ratios between installed base and new product sales as well as between lifecycle and investment costs. An alternative indicator would be the penetration of the customer activity chains.

Theoretical concerns are mostly drawn from the factor analysis and MDS. Considering the main research themes derived from the factor analysis, we propose to better link the themes on solutions ((i) solutions delivery, and (ii) solution marketing) and themes on services in manufacturing companies ((iii) service business performance and (iv) services in manufacturing). Services in manufacturing could benefit from solution research by adapting the emphasis on integrating products and services rather than bundling them. Integrating means that services in manufacturing should investigate interrelationships between products and services. Instead of arguing that products should be bundled with outsourcing services, research should explore how such outsourcing service changes the research & development of new products and/or the product designs and features.

Considering the results of the MDS, there seem to be two theoretical gaps. First, there is a need for a stronger micro-foundation of service infusion research. Micro-foundation range from understanding service innovation processes, individual competence and behavioural attitudes facilitating service and/or customer orientation, information and communication technology for service delivery and service innovation, service pricings, and so on. Second, there is a call for a macro-foundation at the higher strategic level in product-oriented firms. Creating a stronger macro-foundation could start with investigating the role of merger and acquisitions in the service infusion processes. The existing studies implicitly assume that companies grow the service business organically by ex-tending the breath of services and by building the necessary service competencies. Mergers with service specialists or acquisition of service firms are an alternative strategy, which seems to be favoured by larger corporations.

A stronger macro-foundation should clarify how services create competitive advantages. We need a better clarification on how companies achieve a situation where customers benefit directly from service competencies. These service competencies have to be considered as co-created with customers in order to transfer them into a resource-position barrier for competitors. However, co-creating competencies with customers can limit the ability to create strategic innovations, which lead to leaps in customer value, form new value constellations, and are radically new to customers (Matthyssens and Vandendempt 2010).

Uлага and Reinartz (2012) argue that competitive advantage does not derive from service competencies alone, but rather from the combination of product and service competencies. To gain a deeper understanding of competitive advantages derived through services, service differentiation should be conceptualized not as a single factor enhancing competitive advantages, but rather as interacting with other factors such a market orientation and innovation (Gebauer et al. 2011).

Finally, future macro-foundation research should capture the diversity in the competitive landscape. Competitive advantages have to be sustained against other product-oriented firms competing on product prices and/or differentiation, suppliers competing on spare part prices and availability, specialized service providers competing through economies of scales and lower costs, and even customers. Only by continuing fundamental management theories such as contingency-theory, the resource-based view, or service-dominant logic informing the solution marketing contributions and by opening-up to theories such as boundary of the firms, knowledge-based theories of the firms, and market orientation for achieving competitive advantage, researchers are able to tackle the complexity of the competitive landscape.

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SERVICE PERFORMANCE MEASUREMENT: EASIER SAID THAN DONE

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The following is an excerpt from Chapter 10 of *Essentials of Service Design and Innovation* by Dr. Sampson (available from <http://services.byu.edu> and <http://www.amazon.co.uk>)

1 PERFORMANCE MEASUREMENT AND CUSTOMER FEEDBACK

It has been said that “you cannot manage what you cannot measure.” While there is some truth in that statement, it is also misleading because it implies that the only things that matter are things that can be measured, which is a narrow-minded perspective. There are many managerial issues that matter but which are difficult if not impossible to measure, at least in quantitative terms.

Measurement allows us to determine if a process is performing as it should. Providers usually measure performance of manufacturing operations according to relatively objective and precise metrics. In manufacturing environments, machine performance is measured according to the number of defect-free products it produces. Products are measured using tools such as calipers and lasers. The measurements are generally numerical, and thus can be compared to numerical engineered standards.

Customers’ measurement of product performance is usually less objective. Instead, customers gage product performance according to whether or not the product meets their individual needs. A product that meets the customers’ needs is judged as good and a product that fails to meet the customers’ needs is judged as bad, regardless of whether or not the product met the provider’s engineered specifications. The goal of product providers should be having engineered specifications match up with customer needs, as discussed in Chapter 9.

Performance measurement for customer-interactive service processes is a bit sketchier. On one hand, providers want the interactions to be according to some designed specifications. For example, a technical support help desk may measure the amount of time each agent spends on the phone with each customer, and measure the time it takes to resolve each technical support issue. The goal might be to keep those times under some appropriate target value.

Conversely, the help-desk customers measures performance in terms of whether the interaction was appropriate and whether or not their problem was resolved. Customers might desire speedy and efficient problem resolution, but not at the sacrifice of personal attention to their individual needs. Problems may occur when performance from the perspective of the provider conflicts with performance from the perspective of the customer. Speedy and efficient interactions may not adequately address customer needs, and personalized interactions might not be very speedy and efficient.

Ultimately, providers need to realize that they get from employees what they measure. Providers that measure speed of interactions get speedy interactions. Providers that measure personalized interactions get personalized service. Of course, providers have multiple objectives, and may want speedy and personalized interactions.

However, there is a significant difference in how easy it is to measure objective performance versus subjective performance (i.e., the satisfaction of customer needs). Examples are shown in

Table 1. Providers often focus more on the easy things to measure than on the value of customer engagements, which can be difficult to measure.

Table 1: Varying ease of measurement

	Easy to measure	Difficult to measure
Healthcare	Number of patients seen. Amount of time spent with each patient.	Quality of medical advice. Improvements in health attributed to prescribed treatment.
Education	Number of students taught. Student knowledge assessed by standardized test scores.	Student ability for creativity and critical thinking. Complex thinking skills. Value of education.
Legal services	Number of clients engaged. Billable hours.	Expertise of work performed. Impact of expertise on outcomes.

Ultimately, the difficulty in measuring performance in terms of customer value comes down to the difficult in measuring customers in general. Specific issues contributing to this difficulty are described in the next section.

2 PERILS OF MEASURING CUSTOMERS

1. Customer measurement is subjective. Making a subjective measure numerical does not make it objective. For example, asking customers “On a 5-point scale, how satisfied were you with the timeliness of service?” may get a numerical response, but even the meaning of each scale point is a subjective judgment.

2. Customer measurement is intrusive. The very act of customer-measurement of service performance can influence perceptions. The idea that measurement influences outcomes was observed many years ago as the “Hawthorne Effect.” For example, be careful about asking customers for complaints or problems with the service, since research has shown that such questions inspire negative thinking and can promote dissatisfaction that otherwise would not be recognized. It is justified to ask for complaints if the service provider is willing and able to appropriately act on them.

3. Customer resist being measured. Most customers do not consider quality measurement to be value adding, therefore resist providing measurements. This resistance increases as the customers' cost of providing measurement increases. For example, many customers consider it a hassle to fill out customer satisfaction surveys. Giving thoughtful feedback to the company requires mental effort, which many customers are not willing to expend. As a result, response rates for customer satisfaction surveys may be no higher than 5 to 15 percent (Sampson, 1996).

4. Customer measurement is subject to the “Halo Effect,” which means customers subconsciously (or consciously) combine individual components of quality and performance into an overall quality perception. Attempted measurements of individual components may actually have more to do with the overall perception than the individual components. Often, service providers desire to know which components of the service delivery process are in need of improvement and which are okay. Given the halo effect, the problem is that customers form overall opinions and bias their report of each component based on that overall opinion.

5. Customer measurement is subject to self-selected sampling. It is possible to influence sampling, but very difficult to control sampling. When we control sampling we know how survey-responding customers (sampled) compare with customers in general. Strategies to increase response rates, such as awards or drawing for prizes, influence some types of customers more than others. Therefore, it is important to consider sample bias.

Sampling bias describes how customers for which we have measures compare with customers in general. How do we know if the customers who give opinions represent customers in general? The answer is “very often, we don’t.” Nevertheless, it is usually reasonable to assume that customer survey responses are biased, differing in some way from the attitudes of customers in general. For example, we may believe that customers in a hurry are less likely to give a quality evaluation than customers

with time on their hands. Therefore, we wind up surveying a disproportionate number of those with time on their hands, under-representing the attitudes of customers in a hurry. The responses to questions like “Was our service fast enough?” would not capture what hurried customers think.

6. Customer measurement is subject to scale interpretation. It requires the customer to interpret both their perceptions and the measurement scale. Two customers with identical perceptions might interpret the measurement scale differently, resulting in different measurements. It is a fallacy to assume that two customers who mark “good” on an “excellent-good-fair-poor” scale have the exact same opinion. Some customers may consider “good” as sufficiently adequate, whereas others may consider “good” to be substandard. As with item 1 above, it is presumptuous to think that a customer mark on a defined scale is a precise, comparable measurement.

For these and other reasons, most providers flounder when it comes to customer measurement. For example, a government research organization called Technical Assistance Research Programs, Inc. (TARP) studied twenty-two large “customer-driven” companies and found that the companies spent a median of \$1 million and employed the equivalent of 13 full-time professional staff per year on customer feedback systems (Goodman, DePalma, & Broetzmann, 1996). TARP researchers report that “many of these companies have little to show for their investment” in their customer feedback systems.

Much of the problem rests with the approach providers take in measuring customers. Despite lip service, customer feedback is often not taken seriously. For example, Gilly and Hansen (Gilly & Hansen, 1985) report that 44 percent of complaint letters sent to businesses received no response whatsoever, and it seems unlikely that these companies took any other action except perhaps to reprimand someone. Hart, Heskett, and Sasser (1990) report that more than half of all company responses to customer complaints actually *reinforce* the customers’ negative reactions.

Perhaps an even bigger problem is the unsystematic way providers go about gathering and using customer measurements and feedback. Although commissioned market research studies follow scientific methodologies, the ongoing customer feedback systems are poorly designed. The availability of Internet technologies has helped but also compounded the problem, making it easier to collect “big data” about customers but difficult to get any value from the data. After years of studying show customer feedback systems used by firms I conclude that very few have systems that work.

3 HOW TO MEASURE CUSTOMERS

My research indicates that a core reason good companies fail to harvest value from customer feedback is because they *start* by gathering customer feedback. Isn’t that what they are supposed to do? Can they act on the data if they don’t first have the data? Well, no. Neither can they act on the data if they do not have data that is actionable. And it is unlikely that they will act on the feedback if there is no system in place for putting the feedback to work. How can they have an effective system if it is not tied to functional areas of the organization?

Identifying where to use the feedback is one of the questions that need to be answered before an effective customer feedback system can be put in place. Also, before gathering customer feedback, every company should start by carefully defining the objectives of customer feedback in the quality improvement process. Therefore, a total quality approach to applying customer feedback system should start with the following issues:

- defining *where* information is needed and *who* will use the customer feedback,
- specifying *what* the goals and objectives for the feedback will be (or *how* the feedback will benefit the company), and
- using these goals and objectives to determine *what* feedback should be collected, *how* it should be collected, and *how* it should be analyzed and used.

In other words, a key to getting value from customer feedback is understanding how the information can be used *throughout* the organization. Chapter 10 of *Essentials of Service Design and Innovation* describes a framework which will help address these *where*, *who*, *what*, and *how* issues.

SERVITIZATION TRANSFORMATION:DRIVERS, BENEFIT AND BARRIERS

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ABSTRACT

The study described in this paper has set out to build the evidence base underpinning servitization transformation. We applied a Delphi research methodology from 33 senior executives, in 28 different sized organisations, from a cross section of British industry. Our findings focus on servitization: (1) drivers, (2) benefit (3) barriers. The four findings are presented to contribute to our understanding of the transformation processes that manufacturers to compete through servitization.

Keywords: Servitization Transformation, Change Management, Operations Management

1 INTRODUCTION

Businesses in developed economies is keen to promote growth through servitization. Previous studies suggests the adoption of servitization can bring growth in revenue, competitiveness and better natural environment (Baines and Lightfoot, 2013, Sakao and Lindahl, 2009). Organisations can implement various servitization strategies, for instance they can extend their provision of intermediate services (e.g.; condition monitoring, breakdown, repair), or move engage in a corporate take-over of a conventional services provider (e.g.: consulting, accounting, training firms)(Gebauer et al., 2013, Ulaga and Reinartz, 2011) .

The advanced services imply a redefinition of the boundary between those activities that are carried out by the customer and those performed by the manufacturer. Confusion arises around the definition of advanced services because particular contracting features are often coupled. Our study defines advanced services with four key features:

- Pay-for-use revenue payment: pay-per-click, pay-as-you-go, power-by-the-hour etc. are all terms used commonly to refer to advanced services.
- Long-term contracts: Contracts of featuring 20-25 years.
- Risk management: The provider takes on the responsibility for ensuring asset availability, condition and performance.
- Commitment to on-going process improvement and cost saving.

When these four features are coupled with the principle of delivering a capability, contracts become sophisticated and demanding.

Exploitation of servitization requires organizational level insight of the change processes. Such a transformation was seen to be fundamental to a servitization journey, with base and intermediate services forming part of their portfolio.

Our study has focused on those organisations that have been engaged historically with Original Equipment Manufacturer (OEM), and that have changed their business models from being production-centric to services-focused (Baines et al., 2007, Mathieu, 2001). These organizations move away from reliance on simply 'selling a product' and builds on technological capabilities.

Three boarder research questions are addressed in this study; (1) what factors have driven servitization adaptation across supply chains? (2) What are the actual benefits that both customers and manufacturers have realised, how well did these align with their drivers, and what other benefits were realised? (3) What factors are inhibiting and enabling the adoption of these services within both customers and OEMs?

Our study contributes to understanding of the process of servitization. The four findings summarised to demonstrate servitization transformation in practice. These findings have arisen from the collective experiences of 33 senior executives, in 28 different sized organisations, from a cross section of industry. All methodologies have their limitations, but we have found this Delphi approach valuable in eliciting a rich insight into industrial practice.

2 METHOD

Our research adopt the Delphi method, a systematic and interactive research technique for obtaining the judgment of a panel of independent experts on a specific topic (Hallowell and Gambatese, 2009). Throughout this study the research team partnered with Xerox. Collaboratively, the research team identified suitable experts, developed a data collection protocol, distributed the questionnaires to all the panellist and established a feedback mechanism to improve the precision of the responses and foster a group consensus.

In all, 33 experts from 28 organisations participated between November 2012 and May 2013. In each case senior managers have been interviewed, their responses recorded and transcribed. Three rounds of interviewing were carried out. The first captured the bulk of the data, which the research team then compiled, and clustered evidence around key themes. This was then fed back to the experts, as a second round, who then responded with refinements and additional data. A third round was then executed as a final check for anomalies and convergence of findings.

3 TRANSFORMATION OF ADVANCED SERVICES

The results from the Delphi study lead us to refine our knowledge about (1) the servitization drivers in the UK, (2) the servitization strategy benefits, and (3) enablers and inhibitors affecting OEMs. Each of these topics are now discussed individually and summarised as a key finding.

3.1 Drivers

The market pull for advanced services can happen through direct and indirect routes. Directly, OEMs were very much encouraged to move to services by their customers. Indirectly the UK governments have previously helped to stimulate servitization through large infrastructure projects where it sought to encourage private finance. Alstom Transport illustrates how this occurred;

'Prior to privatization national operators, like British Rail and London Underground, carried out their own maintenance. They bought their own rolling stock, and in some cases with British Rail they made their own. When private finance came into it, it became a matter of risk management, and a matter of the banks and the finance companies saying, 'you want us to provide money, so we want to make sure that the asset remains in tip-top condition and that there isn't any potential compromise to the life of the asset'. To do that, they sought the OEM to be involved.'

The OEMs themselves have encouraged their customers into servitization; For example, Rolls-Royce proposed 'power by the hour' business concept which were put to its customers as innovative ways of doing things, but which also achieve the objectives of keeping out other potential competitors. Understanding the reasons underpinning the early servitization adoption can be analysed through the lens of defensive reasons (preventing competitors from gaining a foothold in their markets) and offensive reasons (gain market acceptance for new innovations that drive growth).

Customers chose to deal with servitized manufacturers to improve their operational performance. For example, British Airways, sought cost savings and improvements in efficiency; the Heart of England NHS Foundation Trust targeted economic drivers; and Hoyer, for instance, wanted a pay-as-you-go system where costs were 'per mile' driven, so that its overall contract costs were more predictable.

Some customers also adopted manufacturers' services for strategic reasons. For instance, British Airways saw these services as taking a lot of its 'pain' away and enabling a focus on the core business of being an airline.

In summary, through this study we identified a number of key drivers of servitization:

Finding 1: The market force through direct customer and indirect government initiatives can help to drive servitization. Diffusion of servitization can also drive from OEM to their customers through defensive and offensive motives.

3.2 Benefit

Our intention has been to translate these benefits into quantifiable business impact. Unfortunately, quantifiable performance data is elusive and too commercially sensitive for many organisations to divulge. Typically we were told 'we don't feel comfortable sharing details about this but we have seen a very significant increase in revenue as a result of us having embraced advanced services. This is a trend we are seeking to harness and continue into the future'. Where we were given evidence, we were often not permitted to publish it.

The benefits of advanced services have exceeded the original motivations for their adoption. For customers, leading adopters have experienced significant cost reductions through the adoption of advanced services. These range from 25-30%. Although the data points are few, there is clear indication that significant savings are possible. Likewise, while we were told of many improvements to services of customers, only Alstom Transport was able to indicate this impact by describing the change in passenger numbers on the West Coast Mainline.

The 'cost reductions attributed to the adoption of services from OEMs' reflects customer desired improvements in business efficiencies, while 'growth of their own services through improved service performance' helps to indicate improvements in their own business performance attributable to the services of the manufacturer.

In addition, customers have also demonstrated improvements in safety and environmental sustainability. MAN Truck and Bus UK reported that the services it provided improved fuel consumption

by at least 10% and reduced CO2 emissions by 10-15%. The University of Nottingham has seen its document management systems as about 70% greener. In addition, these services have enabled structural change that was elusive within the customer.

For OEMs, a move away from relying only on product sales, and diversification into services, has demonstrate a range of significant benefits in terms of growth and resilience. A range of companies indicated that they had either achieved, or are striving to achieve a 50/50 split in product/ service revenues. Although it is difficult to establish the precise make-up of these service revenues, there is clear indication of a 'balanced economy' within OEMs themselves, which has improved their own resilience against economic downturn. As for growth, the evidence we have suggests that OEMs themselves believe they can achieve a growth in services revenue in the region of 5-10% per year. Again, there are many caveats to this figure; the main take-away point is that growth is seen as achievable in an otherwise stagnant economic context.

Moreover, new market opportunities have been created. For example, Rolls-Royce services such as TotalCare have supported the creation of low-cost airline operators because the emphasis on maintaining the product is with the OEMs. There have also been benefits to product development, as exemplified by MAN Truck and Bus UK;

'The truck is a mobile R&D centre...I've now got a ten billion kilometre database of all categories of transport where I can show quite clearly what our vehicles cost to operate'.

For the wider economy, the companies we have studied certainly indicate potential, with examples of growth ranging from 5 - 10% per year. There is clear evidence that servitization is a response of manufacturers in advanced economies to external pressures; a chance to differentiate their offering; and a way to support economic restructuring and growth. Conceptually, servitization offers an opportunity that can impact upon both national and regional growth. The senior executives that have participated in this study reinforce the message comprehensively:

'Britain went too far towards services, and has got to get back to manufacturing ... but the two are completely complementary in these terms. [GKN].

You've got a safer, more reliable, more economical and more environmental installed based, number one. [MAN].

'It presents an opportunity for companies which are basically listed on the UK Stock Market to get a foothold in other markets in the world. [BAE]

In this study we have engaged executives from a set of organisations that are significantly important to the UK economy. Across these, there is little doubt that competing through services are a vitally important concept for the future. It is not a panacea, it is not for all organisations at all times, but it is an aid to improving the commercial and environmental sustainability of the national economy.

In summary, through this study we now understand about benefits that:

Finding 2: Servitized manufacturers and their customers have realised the benefits they sought and, also, found that there are additional benefits that strengthen their competitiveness. Although elusive, there is evidence that servitization has a very positive impact on resilience, efficiencies and growth. Trade-offs are however inevitable to OEMs as they sacrifice more traditional revenue streams.

Finding 3: Resilience and growth in a developed economy can be positively impacted by servitization. While such economies are complex, multi-faceted and unpredictable, there is unquantifiable real revenue growth amongst OEMs that deliver services successfully. Consequently, the executives in our study see

significant potential for both the regional and macro-economy if the opportunity presented by these services-focused business models can be harnessed more effectively.

3.3 Barriers

Customers resist engaging in advanced services where they are unconvinced, uncomfortable, or unable. There are practical factors around: ease of product substitution (e.g. if it fails it can be easily replaced); availability of suppliers that can offer a sufficient range of technologies; and institutional unwillingness to engage in outsourcing-style contracts.

Adoption will also be hindered where there is fear that being overly dependent on a single supplier may restrict the customer's ability to obtain value for money (both now and in the future). For example, Finning UK described how some of its customers fear that putting 'all their eggs into one basket' may restrict their ability to get best value for money, and Islington Borough Council stressed the importance of knowledge retention to enable market re-entry should this be desirable.

Even when appealing, the customer may not be able to adopt advanced services. Limiting factors exist around process compliance, budgeting systems, data systems, legislation and contracts. For instance, Heart of England NHS Foundation Trust stressed the importance of process compliance before services can be considered for outsourcing. Contract complexity can inhibit both the customer and OEM. Another factor is a lack of people with the appropriate contracting skillsets. Even when a contract is in place, there may be a reluctance to continue engagement, if the customer feels service levels are not being met or more generally that value is not being demonstrated.

OEMs share inhibitors around contracting, finance, and data systems. Lack of skills to construct usable and reliable contracts is a major inhibitor for smaller organisations, as is lack of availability of finance from third parties to 'unlock' services contracts.

Assuming that the OEM is committed to pursuing servitization and delivering advanced services, there are also particular inhibitors that impact its ability to follow and sustain such a strategy. Linked to contracting is the lack of intellectual property within the OEM to innovate and modify its technologies to give the cost and efficiency savings.

'Sometimes our ministry tries to buy rights to IP....you'd have thought we were in a strong position. The Australian Air Force came along a bit later and actually got rights to the IP. So somehow or another our Ministry of Defence didn't do ... didn't match up to the negotiations that the Australians got.' [Marshall Aerospace]

Skillsets in general are a major concern for OEMs.

'...if you look at where technical skill sets are developed, it's generally within a new build environment. And my concern is with manufacturing- certainly within the heavy industries- actually being minimised, then...will that know-how and know-why and capability be there to sustain service business in the longer term? Now I think if you look at the service businesses in the UK then there's still very heavy skill sets that are there from manufacturing ... My concern is, in 20 years will we still have that same capability?' [Alstom Transport]

In summary, through this study we now understand about the servitization barriers that:

Finding 4: Exploitation of servitization is seen prohibited when OEMs lacks confidence and capability of delivering advanced services or customers are unconvinced or uncomfortable with these. This innovation is fragile, language needs to coalesce, and nurturing is needed while our understanding develops. OEMs in particular need help with the culture change, skills, contracts and financing that are

particular to servitization, delivering services whilst building their technology innovation capabilities along the way.

4 CONCLUSION

This study has set out to build the evidence base underpinning servitization transformation. The findings so far discussed have focused on three areas: (1) servitization driver, (2) benefit of servitization strategy, and (3) barriers that prevent diffusion of servitization.

This study contributes to our understanding of servitization. The four findings summarise how transformation is seen to be taking place in practice. These have arisen from the collective experiences of 33 senior executives, in 28 different sized organisations, from a cross section of British industry. All methodologies have their limitations, but we have found this Delphi approach valuable in eliciting a rich insight into industrial practice. To extend our understanding further, we would suggest a similar approach to investigating how servitization adoption fails. Our study has exclusively targeted organisations that have succeeded with the adoption of servitization either as providers or consumers. It would be helpful to gain insights into organisations that have chosen not to take this route, and it would be valuable to know more about OEMs who have in some way failed to achieve the desired outcomes. Such knowledge would be extremely valuable to progressing the servitization debate further.

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COMPETITIVE STRATEGY, MOTIVES AND BENEFITS

SERVICE OFFERS AS COMPETITIVE STRATEGY IN INDUSTRIAL FIRMS - WHY STRATEGIC RELEVANCE NOT NECESSARILY LEADS TO SERVICE SUCCESS

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ABSTRACT

Service offers are highly diffused in industrial firms. But, while numerous manufacturers generate a relevant turnover with services, a significant share of companies is still struggling with its service business. A possible reason for this situation may be seen by the relevance of services within the competitive strategy of manufacturers. But yet, little is known about the role of service-oriented competitive strategies in industrial firms. Are so called service strategists, more successful with service offers than other manufacturers? Which companies hold service-oriented competitive strategies and how they differ from other industrial service providers? For answering these questions, this paper gives first insights into the role of service strategists in German manufacturing industries and their characteristics by means of the *German Manufacturing Survey 2012*. Based on the results, we derive implications for the strategic management of industrial companies for supporting decisions about the involvement of service-oriented competitive strategies of manufacturers.

Keywords: service strategists, servitization, empirical analysis, competitive strategy

1 INTRODUCTION

Service offers are highly diffused in industrial firms (see Baines et al. 2009; Lay et al. 2010; Dachs et al. 2013). These service offers go from traditional services, as maintenance and repair, to innovative Product-

Service Systems. In the past but also up to now, services were seen as a necessary evil, which had to be offered, however, not as a strategic asset. But in the context of servitization (see Vandermerwe/Rada 1988), they become increasingly more important for manufacturing industries in

the last decades (e.g. Lay et al. 2010; Baines et al. 2009; Oliva/Kallenberg 2003; Mathieu 2001). While numerous manufacturers generate a relevant turnover with services, a significant share of companies is still struggling with its service business. In Germany for example, one out of six manufacturers, which offer services, are not able to generate any turnover with their service offers (see Lerch et al. 2013). Finally it can be stated that the share of service turnover highly differs between manufacturers.

A possible reason for this situation may be seen in the underdeveloped role of services within the strategic orientation of manufacturers (e.g. Gebauer et al. 2005). While the majority of manufacturers differentiates against competitors by high quality products, cost-efficient products or innovative products, there also exist firms, which compete by services offered additionally to their products. As literature already points out, combining products and services can improve the competitive advantage of firms (e.g. Vandermerwe/Rada 1988). Moreover, some authors suggest service offers as differentiation strategy for firms in established markets (e.g. Robinson et al. 2002). Thus, the question arises, if manufacturers competing by services are really more successful with their offers or rather are able to generate a higher service turnover than others?

But yet, little is known about the role of manufacturers, which use services as differentiation strategy. Are companies with service-oriented competitive strategies, so called service strategists, more successful with service offers than other manufacturers? Which companies hold service-oriented competitive strategies and how they differ from other industrial service providers? For answering these questions, the paper aims

- to give insights into the characteristics of service strategists and their role in manufacturing industries by means of a quantitative empirical analysis and
- to work out managerial implications for industrial firms concerning the differentiation through services against competitors.

To reach these aims the procedure of this paper is as follows: Firstly, we give an overview about some existing works concerning the field of differentiation and competition by services. Afterwards in section 3, the characteristics of service strategists in manufacturing industries is analyzed based on the data of the *German Manufacturing Survey 2012* (see survey documentation in Jäger/Maloca 2013). By means of these insights we deflect implications for practice for supporting the decision about strategic embedment of services in the competitive strategy. The paper closes with a summary of the findings as well as an outlook about future research.

2 SERVICES AS COMPETITIVE STRATEGY IN INDUSTRIAL COMPANIES – ASPECTS FROM LITERATURE

The field of strategic involvement of industrial services is mainly unexplored. In literature there exist comparatively less contributions dealing with this topic. For instance, Velamuri et al. (2011) conducted a systematic literature review on hybrid value creation identifying eight research categories with associated roots, amongst others the so called “strategic view” on product-service systems. They divided this strategic view in studies dealing with competitive advantages of services for industrial companies and studies covering concepts and barriers of product-service systems. In this context the authors show, that to achieve a competitive advantage by a concerted service strategy and a connected hybrid value creation process, particularly customer needs have to be met.

But the strategic involvement of services by industrial firms cannot only increase the value creation and delivery to customers, but also change the competitive dynamics of whole sectors (Vandermerwe and Rada 1988; Vandermerwe 2000). However, the question remains which sectors are especially appropriate for strategic service interests. Robinson et al. (2002) suggest that the strategic involvement of services and the bundling of products and services within the scope of differentiation strategies is promising not in emerging sectors, but especially in mature industries like manufacturing. For instance, Gebauer et al. (2010) studied diverse service strategies of manufacturing companies and explored four different strategies, which the authors divided in “after sales service provider”, “customer support service provider”, “outsourcing partner” and “development partner”, which all have

their individual strategy-structure characteristics. The authors conclude that a specific strategy-structure configuration is needed to succeed with the selected service strategy.

We can state that there already exist some aspects from literature concerning the differentiation of services as competitive strategy in industrial firms. In the following the attempt is made to shed some light on the characteristics and role of service strategists by using recent empirical data to present first findings on the relevance of service offers as competitive strategy. For our analysis we define a service strategist as an industrial company, which uses its service offers for differentiating against competitors or rather as competitive factor and tries to generate competitive advantages due to this differentiation strategy.

3 RELEVANCE AND CHARACTERISTICS OF SERVICE STRATEGISTS – EMPIRICAL INSIGHTS

For analyzing the relevance and characteristics of service strategists in manufacturing industries the *German Manufacturing Survey* 2012 of Fraunhofer ISI was used. The *German Manufacturing Survey* is conducted every two to three years since 1995. It is a part of the *European Manufacturing Survey*, which is the broadest survey on modernization trends in production and technology-oriented companies in Europe. The main topics of investigation are the production strategies, the utilization of innovative organizational and technical approaches in production, issues pertaining to off shoring, as well as offers of product-related services, their development and outcomes. In addition, company data and performance indicators such as productivity, flexibility and quality are collected.

In 2012, the survey addressed a random sample of manufacturing firms with at least 20 employees from sectors 10 to 33 according to the NACE classification Rev. 2. The dataset covers 1,594 manufacturing firms and represents the German manufacturing industry comprehensively. For further information about the 2012 survey see also the documentation of Jäger/Maloca 2013. The following analysis are based on the collected data from this survey.

3.1 Service strategists in the context of servitization in German manufacturing industries – an overview

With regard to a strategic orientation, such success factors as high quality of products, low prices, and development of innovative products play the major role in the competitive strategy of the most surveyed companies. But there also exist a relevant share of companies, which differentiates in competition through service offers. In the following as service strategists are classified those firms, who report services as the first or second most important competitive factor for differentiating from competitors. Among all manufacturing companies in Germany those firms account for about 8.5 percent. In Germany 85 percent of all industrial companies are service providers. This means that these companies offer at least one service in addition to their products.

But the relevance of services differs widely between industrial sectors and the single companies. For example the highest shares of service providers hold machinery and equipment (97%), followed by computer and electronics (95%) and the automotive industry (94%). Glass and ceramics industry, chemical industry and metal goods industry show shares around the average by 88, 87 and 85 percent. Below average shares of service providers hold the wood and furniture industry (79%), the print and paper industry (71%) as well as the food and beverage industry (54%).

Firms, which are able to generate turnover with services, hold in average a total share of 14.5 percent of service turnover. This total share can be separated into directly and indirectly invoiced service turnover. Hereof, 6.5 percent is generated by directly invoiced service offers, while the larger share of 8 percent comes from indirectly invoiced service offers. Directly invoiced turnover is generated from services that are paid separately by the customers. Indirectly invoiced services are not directly paid by customers but are covered in the product price. This leads to the situation that customers realize these services as offered for free. The total share of turnover differs from 12 percent to 17 percent between the single industrial sectors in Germany.

Regarding this context we want to examine the group of service strategists. Therefore the next sections show some analysis, which help to characterize these special bunch of firms in contrast to other industrial firms and leads to a deeper understanding concerning the role of these firms in the context of servitization.

3.2 Share of service strategists by sector

At first, a more detailed view on the distribution of the service strategists across different sectors seems promising for providing new findings. When investigating the question, in which industries service strategists can be found, huge differences between the sectors can be identified (see figure 1). In sectors with traditionally high shares of service providers, like machinery and equipment or automotive industry, where it is nearly mandatory to offer product-related services, service strategists are barely shown. In these sectors with typical high shares of service providers, only around 4 percent of the firms are service strategists.

In contrast to this situation, service strategists are likely to be found in sectors with a comparatively low share of service providers. For instance, 26 percent of manufacturers in the printing and paper industry try to demarcate through service offerings from their competitors. They are followed by manufacturers of food and beverage with a share of 14 percent of service strategists. Other sectors have a average share of service strategists between 3 and 9 percent.

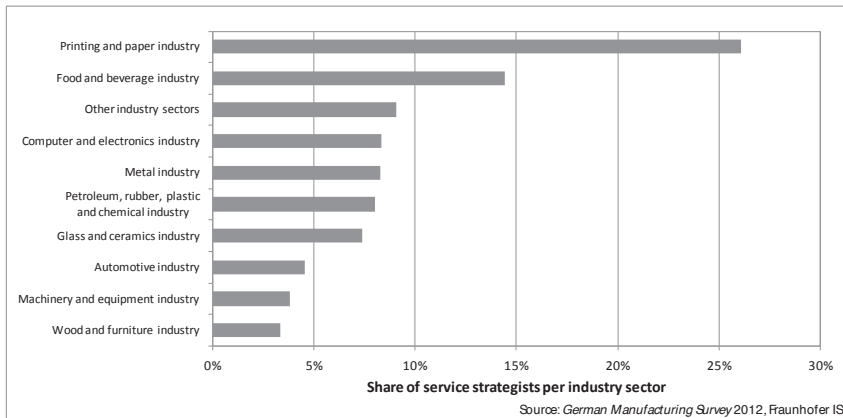


Figure 1: Distribution of service strategists across different industrial sectors

3.3 Characteristics of service strategists

Service strategists are spread over all groups of manufacturing companies. As table 1 shows, service strategists hold a slightly higher share of firms producing medium complex products, especially compared to manufacturers of complex products. Furthermore, they rife in companies, which develop their products in standard programs and not by customer's specification or standard programs with variants. Moreover, service strategists hold a higher share of companies with single batch sizes than companies with medium or large batch size productions. Finally we can state, that firms with service-oriented competitive strategies are more diffused in small and medium sized companies than in large enterprises. The share of service strategists by corporate characteristics of the companies is shown in table 1.

		Service Strategists in %	Non Service Strategists in %	Total n
Company Size	up to 49 employees	9,8%	90,2%	532
	50 to 249 employees	8,2%	91,8%	612
	250 and more employees	6,4%	93,6%	204
Product development	Customer's specifications	7,4%	92,6%	653
	Stand. program incl. variations	8,6%	91,4%	420
	Standard program	13,6%	86,4%	147
	Not existing	7,1%	92,9%	98
Batch Size	Single batch size	9,7%	90,3%	372
	Small/medium batch size	8,3%	91,7%	721
	Large batch size	7,0%	93,0%	229
Product Complexity	Simple products	8,7%	91,3%	253
	Medium complex products	9,5%	90,5%	663
	Complex products	6,3%	93,7%	397

Source: German Manufacturing Survey 2012, Fraunhofer ISI

Table 1: Share of service strategists by corporate characteristics

3.4 Turnover of service strategists

Finally it seems important to explore, if companies holding service-oriented competitive strategies are able to generate a higher share of service turnover than firms, which generate turnover by services but do not compete by their service offers. A comparison of the share of turnover between service strategists and non service strategists shows that companies differentiating through services do not achieve a higher share of services relating to the total turnover. While service strategists hold an average share of service turnover of 15 percent, non service strategists reach 14 percent (see Figure 2). But as we can highlight, service strategists have a higher discrepancy between direct and indirect invoiced service sales than other industrial enterprises. While the proportion of direct sales for service strategists accounts for about one-third of the total turnover in services (5 of 15 percent), for other companies the proportion of direct service turnover is nearly equal to the share of indirect services sales (6 of 14 percent).

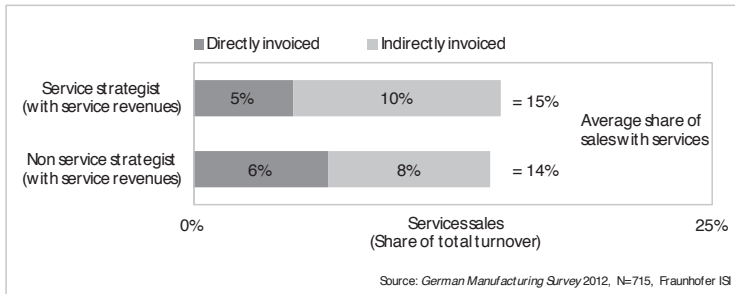


Figure 2: Share of turnover with services, directly and indirectly invoiced, according to strategic priority of services

4 IMPLICATIONS, CONCLUSIONS AND OUTLOOK

Summing up, we can state that service strategists do not generate a higher share of turnover with services than other firms. Moreover, these firms are less found in groups of companies, which tend to generate high shares of service turnover and which hold high shares of service providers. So we

assume that these companies use their service offers not for the purpose of boosting their turnover. They rather use it as a niche strategy in markets, which tend to lower service orientations. Moreover the high share of indirectly invoiced turnover shows that the majority of services is offered to clients for free. Service strategists understand their service offers as complete solution for customers, which is integrated in the product price. This strategy aims to improve the satisfaction of customers and hence leads to a higher customer loyalty. This conclusion, in terms of using services not as a driver of turnover but as niche strategy, leads to the assumption that service strategists are an individual actor in servitization and moreover, a hidden driver of servitization.

Basing on these empirical insights concerning the characteristics of service strategists we can formulate the following assumptions as hypotheses:

- Differentiation through services is not an appropriate strategy for every type of industrial company. In fact this strategy is only practicable for specific market conditions as e.g. a lower service orientation. How these market conditions may be characterized in detail has to be analyzed deeper.
- Firms holding service-oriented competitive strategies do not understand services as a driver of turnover, but rather as strategy for improving customers' satisfaction and loyalty. This is a completely different understanding of offering services.
- Up to now, it is not yet clear how to become a service strategist. In this paper we didn't regard any internal aspects of the firm. So the assumption arises that there are individual transformation processes for turning to a service strategist.

Now the question arises how managers can use these findings for acting in practice? In fact, companies differentiating through services appear in markets with low shares of service providers and hence in markets with a lower service orientation in general. Service-oriented competitive strategies lead not necessarily to a higher turnover in general and hence, are no silver bullet for industrial companies. Service strategists do not compete with services for boosting their turnover, but rather use it as a niche strategy for improving the satisfaction and loyalty of their customers. Consequently this strategy is only fitting to companies, which understand services in addition to their products as complete solution. Moreover these firms should cover the costs for services in the product price. The customer will realize this offer as full package without any additional costs.

So finally, what is the role of service strategists in manufacturing industries and what is their contribution to the trend of servitization? After this paper we can state that service strategists definitely play an individual and separate role within the context of servitization. Indeed they hold only a share of 8.5 percent of all industrial companies in Germany. However they belong to a group of manufacturers, which is mostly underestimated in servitization research. The reason for this situation can be seen in their characteristics. They appear in sectors with lower shares of service providers and do not necessarily belong to these groups of firms, which generate high service turnover. However the unique feature of this group, using services not for boosting their turnover, but as niche strategy in competition, makes it to a hidden driver of servitization.

In this paper we analyzed the competitive frameworks and market conditions for turning to a service strategist, but we did not analyze how to become a service strategist. Future research could focus on giving deeper insights into the behaviour of service strategists and do studies about how they transform over time. For giving deeper practical implications it seems important to analyze internal activities and reflect it to external conditions. These analysis may help firms to develop service-oriented competitive strategies and to overcome barriers during such a transformation process.

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GROWTH THROUGH SERVICES

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ABSTRACT

The question of how to grow profitably is high on the strategic agenda of most companies, yet only few are able to realise it. Many businesses are struggling to maintain their existing revenue and profit margins, let alone achieve ambitious growth rates, while others are exhibiting very healthy growth rates. In 2013 Noventum undertook research to understand *why* this disparity exists.

Given the fact that significant variations appear in the growth strategies companies choose and the role services play within this strategy, Noventum's research set out to answer the following two questions:

- 1. Which are today and tomorrow's key drivers for profitable growth?**
- 2. What role do services play in respect of growth?**

Our research comprised of in-depth interviews and a survey conducted amongst board members, service managers and directors, primarily from B2B product-orientated companies. The key findings are that companies which pursue a broad portfolio of growth strategies, including advanced services, grow faster and have better profit margins. Other success factors for growth are innovation for customer value, agility and alignment of service and corporate values.

KEYWORDS: B2B Production Industry, Growth Drivers, Growth Strategies, Advanced Services.

1 INTRODUCTION

1.1 Research Background

Regardless of industry, the pursuit of profit and growth is a priority for practically all companies. Throughout our long-standing engagements with various board members, a repeated concern mooted in recent times is that double-digit growth is no longer easily achievable.

From our experience, this issue can be explained by looking at the market life cycle of a product; as the market for various products matures, those products often become commoditised, amidst fierce competition, slowing down market growth and increasing pressure on prices.

In order to cope with this trend, businesses are adopting new strategies designed to re-ignite growth. Their success rates are however, disparate and widely variable.

Our research focuses on investigating profitable growth from a holistic perspective, taking a broad look at the drivers influencing overall growth and the role played by services. Our research answers:

- 1. Which are today and tomorrow's key drivers for profitable growth?**
- 2. What role do services play in respect of growth?**

This paper summarises research conducted by Noventum Service Management throughout 2013 and comprises part of Noventum's ongoing Service Innovation Programme. The full report is due to be published in May 2014.

1.2 Terminology

Growth: There are many interpretations and definitions for the term *growth*. The measures of growth companies use vary depending on the business goals of their shareholders and stakeholders e.g. revenue growth, increasing EBIT, improving return on cost of capital. Within this study, 'growth' was defined as the average increase in overall revenue measured over the three years 2010 to 2012.

Emerging markets: Emerging markets are commonly characterised by high growth rates and low competition due to demand exceeding supply. In these markets the provision of product related services is often mandatory in order to gain credibility for new products and ways of working, as well as ensuring that brand image is maintained.

Mature markets: Mature markets are generally saturated and companies in this environment often experience high competition and a low growth potential. In these markets, services often represent more of a critical differentiator to increasing market share and developing margins. Product related services are a basic need for product expansion, whereas integrated solutions and customer business related services could take more of a differentiating role.

Product-Related Services: Product-Related Services refer to services with the objective of optimising the usage of installed products, technologies and integrated solutions. Break fix, remote support, field services, maintenance, parts sales, installation, customization, upgrades and training are some examples. This may also include product-related services on competitors' or third party products, as well as performance contracts.

Integrated Solutions: Integrated Solutions refer to new solutions made of a combination of hardware, software, consumables and services, designed and bundled together with the objective of addressing very specific customer needs. In some cases, third party products and services may be part of the integrated solution if the equivalent does not exist in the company portfolio.

Customer Business Related Services: Customer Business Related Services refer to the design and implementation of services, which address the customer situation with the objective of addressing their processes. They include benchmarking services, business consulting and outsourcing services. One of the objectives is to increase the total business potential by covering a larger portion of the total value chain of customers.

2. METHODOLOGY

2.1 Research Approach

This mixed-method yearlong research initiative comprised of four overlapping phases shown in Figure 1.

- Phase One: Desk Research: Existing literature on growth strategies and drivers was reviewed in order to refine our focus.

- Phase Two: Exploratory Interviews: In-depth and exploratory interviews were conducted with a broad range of company leaders to maintain a balanced perspective and mitigate bias.
- Phase Three: Validating Survey: An extensive questionnaire delivered to our global network of customers, roundtable members and Service Innovation Community as well as the networks of Service Strategies (our America partner) and the Association for Services Management International (AFSMI).
- Phase Four: Validating Interviews: In this phase in-depth interviews were conducted with a selected group of participants in order to validate and further enrich our findings.

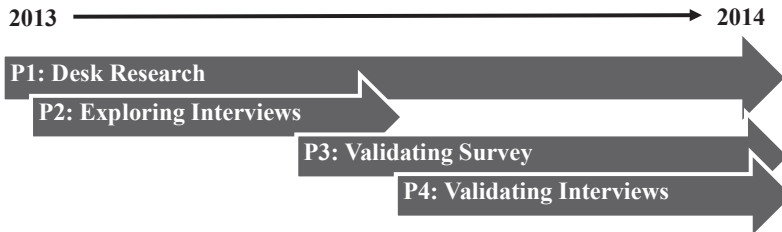


Figure 1: Research phases

2.2 Position of Mergers & Acquisitions in the Research

Within this study, mergers and acquisitions were not addressed as a growth strategy. The rationale being that they are in fact ‘tactics’ to accelerate the implementation of one or more of the five defined growth strategies. For example, acquiring a business with specific know how and competencies can accelerate the development of advanced service offerings. Alternatively, merging with a business that has a significant market share in a targeted geography could accelerate expansion in this market.

2.3 Sample Characteristics

Our research participants comprised 51 board members participating in our exploratory interviews [Phase 2] and 132 senior service managers and directors participating in our validating survey [Phase 3]. Finally, 28 participants ranging from senior managers to C-suite level participated in follow up interviews to validate and enrich findings [Phase 4].

Participants were primarily engaged with international B2B companies (81%) covering a diverse range of industries as shown in Figure 2. Companies also represented a good cross section in size ranging from relatively small businesses to global enterprises (Figure 3).

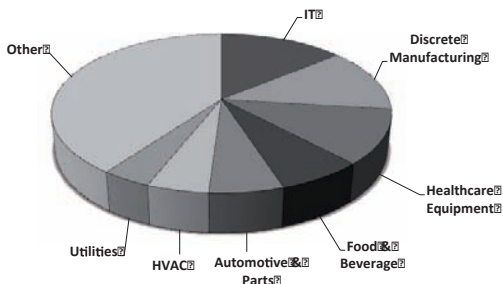


Figure 2: Distribution of industries

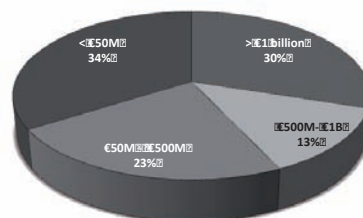


Figure 3: Distribution of company turnover

3 RESULTS

On analysis, only 20% of participating companies achieved an average growth rate of more than 11% for the years 2010, 2011 and 2012. 28% did not grow at all or saw their yearly revenue shrink. The remaining 52% of the participating companies experienced overall growth revenues of between 1-10%.

Furthermore, 47% of the companies generated more than 20% of their revenue from their Service Business, 24% had as service revenue contributing 11-20% of their overall revenue and 29% had a service revenue contributing 1-10% to their overall revenue.

3.1 Growth Strategies

As shown in Table 1 below, our research identified five growth strategies, each of which were employed by the sampled companies to varying degrees.

Table 1: Growth strategies employed by respondents

	Growth Strategy Employed	Type of Strategy	% of respondents
1	Product expansion in mature markets	Traditional	95%
2	Product expansion in emerging markets	Traditional	70%
3	Product-related Services	Traditional	90%
4	Integrated Solutions	Accelerated	50%
5	Customer Business-related Services	Accelerated	60%

Nearly all companies focused on growing their business in both mature and emerging markets through product expansion, as well as the expansion of their product related service offerings. These have been defined as common or *traditional* strategies, because they are employed by almost all companies in their quest for revenue growth.

Significantly fewer companies, focused on more advanced service offerings such as integrated solutions and customer business-related services (strategies 4 and 5).

3.3 Impact of Growth Strategies

One of our primary research objectives was to gain an understanding of the impact of different growth strategies driving overall growth.

As evident in Table 1, most companies pursue growth via a limited portfolio of three common strategies:

- Growing product business in mature markets
- Growing product business in emerging markets
- Growing product related services

Looking at figures 4 & 5, it can be seen that very few of these companies however achieved high growth rates or margins. In contrast, those companies who successfully implemented additional growth strategies experience higher revenue growth and margins.

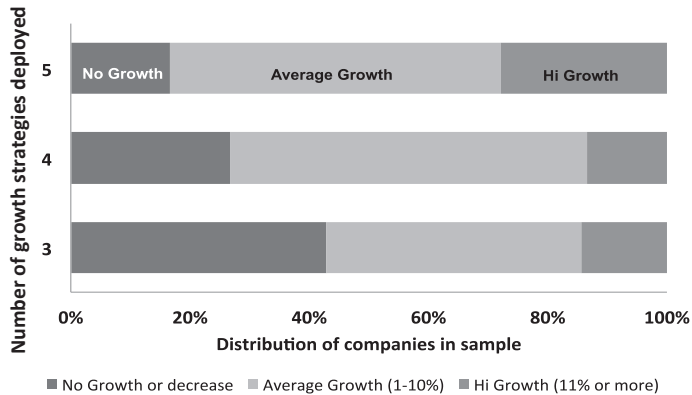


Figure 4: Distribution of growth rates versus the number of growth strategies deployed

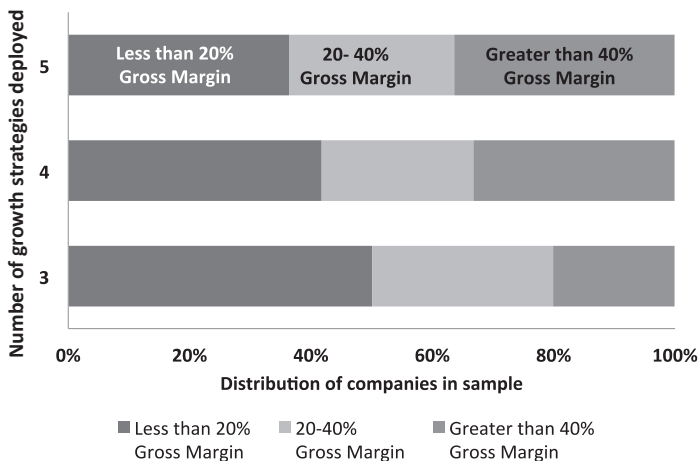


Figure 5 Distribution of gross margin versus number of strategies deployed

Given these findings, it can be concluded that companies are more likely to outperform competitors on revenue growth and margins, if all the above-referenced growth strategies are deployed, including advanced services.

3.4 Common success factors for growth

The best in class companies exhibited a number of common success factors to achieve a high growth rates:

1. **Innovate for customer value:** Being more outside-in, helps companies to better understand customer needs. A true understanding of customer needs, provides insight into how to offer the most value to customers and therefore gives direction to high value innovation initiatives. These often go beyond the desire for new product features.

The impact of focusing on customer value for revenue growth is clearly confirmed by the survey, as companies that use multiple sources of customer insight tend to experience higher levels of growth (Figure 6). Examples of sources of customer insight are; customer surveys, interviews with multiple stakeholders and focus groups.

In addition, most of these companies are characterised by maintaining a balanced portfolio of incremental- and large innovations.

2. **Develop an Agile organisation:** To be able to reap the benefits of the gained customer insights companies require the capability, dedication and culture to rapidly innovate on a continuous basis. Agility enables companies to resolve friction between innovating and running their daily business. As a result these companies are not slowed down by internal arguments or self-interest of departments and people, enabling them to reconfigure their organisation when needed.

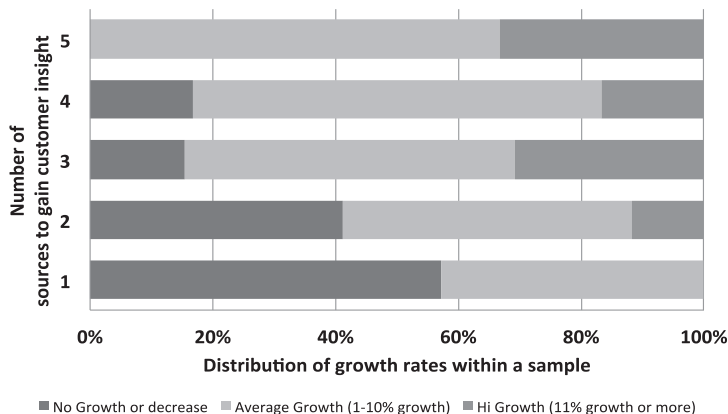


Figure 6: Distribution of growth rates versus the number of sources companies use to gain insight into their customers' wants and needs

3. **Ensure strategic alignment between service- and corporate values:** Many companies have a relatively short-term focus, partly due to external pressure from shareholders, financial analysts and other factors. Given that service revenue only impacts a small portion of total revenue and profit in the short-term, this affects the level of strategic commitment and priority to investment in services. It appears that companies who are able to align their service strategy with their corporate strategy are more successful in developing their service business. Based on the interviews we have identified the following two enablers:

- **Think long-term, act short-term:**
Develop a clear long-term vision of how to develop your service business, making sure each

step bears a tangible and credible contribution to the overall performance of the company.

- **Focus on companywide challenges instead of merely service challenges:** As soon as service strategy shows evidence of significantly solving overall business challenges, the commitment of C-Level decision makers will improve. Improving services will not only grow service revenue, but can also have a significant product pull through, increasing revenue and margin from product sales. Therefore, focusing on the overall value of service for the company will secure commitment.

3.5 Insights into the most common challenges companies face in pursuing growth

The interviews also revealed some insights into the key challenges faced in executing the growth strategies described in Table 1:

- **Product growth in mature markets:** Few technology innovations really contribute to growth. Often products just preserve a company's existing market position. In this context services are often recognised to be an enabler for growth.
- **Product growth in emerging markets:** In emerging markets, companies often find unexpected competition from nimble, focused, entrepreneurial enterprises, deeply embedded in their home markets, with significant cost advantages, ready access to local talent and often a hard-driving founder. These developing country superstars often grow faster and more profitably than their global counterparts.
- **Integrated Solutions and Customer Business Related Services:** With regards to implementing advanced services, key challenges centered around acquiring the required service sales capabilities. Many companies experienced severe challenges in developing new service offerings and standardising advanced services necessary to ensure consistent delivery processes across different geographical regions.

4. CONCLUSIONS

In order to maximise the probability of outperforming the market and competitors on profitable growth, the results are clear, though challenging. We identified the following four key growth drivers in our research:

1. Pursuit of all growth strategies In order to outperform competitors on revenue growth and margins, companies should pursue all the growth strategies available and not just a selected few. This includes growing the business via advanced services in both mature and emerging markets.

2. Innovation for customer value Key to growth and profit margins is a focus on innovation in order to optimise customer value.. Successful companies do this by employing multiple tools to glean customer insights and by maintain a balanced portfolio of incremental and substantial innovations at all times.

3. Agility In order to reap the benefit of customer insights, companies require the capability, dedication and culture to continually innovate their offerings ensuring that processes are streamlined in order to absolve any friction caused in doing so.

4. Strategic alignment between service- and corporate values Companies need to develop a clear long-term vision as to how to develop their service business, making sure each step bears a tangible and credible contribution to the overall performance of the company. Focusing on the overall value of service for the company will secure corporate commitment and thereby further enable (service) business success. Advanced services become a key differentiator in driving companywide revenue growth.

BENEFITS AND SACRIFICES OF AFTER-SALES SERVICES IN THE GERMAN MACHINE BUILDING INDUSTRY

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ABSTRACT

The paper describes different industrial services offered in the machine building industry. Based on a literature review benefits for the customer and benefits and requisites for the manufacturer in offering these services are described. This is a preliminary study, thus implications for future research are derived.

KEYWORDS: Manufacturing, industrial services

1 INTRODUCTION

Industrial services are traditionally a part of the offer in the manufacturing industry (Lay et al. 2009). Especially for complex and long-lasting investment goods there is a customer need for industrial services such as repair, maintenance and training. Today due to an increase in global competition, a high demand for customized products and high technical complexity industrial services are a relevant competitive factor in the manufacturing industry. Manufacturing companies are thus encouraged to professionalize their offer of industrial services. The notion “industrial services” covers different individual industrial services. Different types of categorization for industrial services exist in literature such as pre- or after-sales services, services supporting the product or the customer as well as traditional or advanced services (Gebauer et al. 2010; Lay et al. 2009). However, each individual industrial service has an individual value proposition for the customer. Also the benefits and the requisites for the provider differ for each offered service. For the decision making process on the service business thus manufacturing companies should evaluate different services relating to their specific benefits and requisites. This paper presents the results of a preliminary study on benefits for the customer and benefits and sacrifices or requisites for the provider based on a literature research. As there is a high heterogeneity concerning industrial services this research focuses on the machine building industry. For each industrial service also based on a literature review a description in the context of the sector is put in front. The contribution of this paper is to illustrate benefits and requisites reported by literature that my result for customers and providers for individual services. The paper presents results from a preliminary study; hence next steps in the research process are stated.

2 METHODOLOGY

As current literature mainly focuses on advanced services the more traditional industrial services are mostly aggregated into groups and seldom outlined in detail. Therefore, books mainly on industrial services and PhD theses were reviewed providing a more extensive description. The review includes mainly German literature to have a homogenous cultural and regulatory field of analysis. However as this sector is very export oriented there is a high similarity in the services to the offer of machine builders in other countries. However, in addition selected international papers dealing with the overall

trend of servitization or product-service systems were reviewed too. To get a technical description of individual services additionally textbooks on manufacturing were taken as well as brochures and reports by the VDMA (German association of machine tools and plant engineering).

3 INDUSTRIAL SERVICES

3.1 Maintenance

The maintenance strategy lays down what type of maintenance activity will be performed, when it has to be performed and how often. Basically two different types of maintenance strategies can be distinguished: reactive and preventive strategies (Ryll/Freund 2010). Reactive means that activities are executed after an incidence and these require a fast reaction and high expertise to analyze the situation in order to react on that (Ryll/Freund 2010). Preventive strategies can be distinguished into periodic preventive maintenance (Sihn/Speccht 1996; Kuhn et al. 2006), condition based maintenance (Ryll/Freund 2010) and predictive maintenance (Kuhn et al. 2006). Special cases are so called full-service contracts. Stremersch et al. (2001) define a full service as “a comprehensive bundle of products and/or services, that fully satisfies the needs and wants of a customer related to a specific event or problem.” Full-service maintenance contracts often are remunerated by a fixed rate and comprise the cost for spare parts but not for wear parts (Coperion 2013). Also the scope of a full service contract does mostly not cover additional guarantees e. g. for a certain availability or savings in operating material. However these kind of guarantee can be offered as additional package to these contracts for which the manufacturer is remunerated separately (Aebi Schmidt 2013; Coperion 2013).

Benefit through outsourcing maintenance activities for the customer is to relief employees from the execution and planning of these tasks. Regular maintenance can reduce the probability of a break down due to premature wear or dirt. However due the priority of the core business these activities might be of secondary importance and less regularly executed (Abele et al. 2009; Pearce 2008). Another benefit can be that customer companies transfer the need of keeping costs down to external suppliers. Service providers serve several customers and thus can distribute the labor costs to several customers and thus have an economic advantage (Arto et al. 2008). Maintenance services are often outsourced when there is special competence needed which is not available at the customer company. However this information asymmetry can lead to an opportunistic behavior by the provider especially because the outcome of maintenance activities such as a longer lifetime of a machine (Kuhn et al. 2006) can not immediately be perceived (Ryll/Freund 2010). Other positive effects are that formerly internal maintenance activities now get a market price creating awareness of the relevance of maintenance activities and may improve operating behavior (Benz/Scheiffele 2001). As maintenance is a traditional service offered to machine buyers both customer and suppliers have a high experience in contracting these services. However the outsourcing of maintenance activities can also have negative impact on the culture as employees might fear further reduction on jobs or are reluctant as established processes are changed (Nagengast 1997). A *benefit* for the provider is to be on a regular basis in contact with the customer. This regular contact allows getting information on the usage behavior of the customer, generating ideas in order to improve the product, getting to know explicit or latent needs of the customer company and trends influencing the market of the customer (Baumbach 1998). Long-term maintenance contracts also allow doing a better planning as they might lead to less emergency repairs (Rainfurth 2003). In addition regular visits facilitate to place an offer for a new machine at the right time as well as to gather information of the usage of competitor products (Lay et al. 2009). When the manufacturer will take over the responsibility of the maintenance activities, there is also an incentive for the manufacturer to apply certain design rules such as design for service (Biege 2011). These principles aim to reduce the maintenance effort. The distribution of responsibilities is a crucial issue as machines are very specific and long lasting goods (Lay et al. 2009) and customers are often highly dependent on the manufacturer. A central *requisite* for successful maintenance activities is to have qualified service technicians. They can be supported by formal process descriptions e.g. what to do in the case of a break down (Ryll/Freund 2010). Another important factor is to have information on operation behavior and behavior that signals a possible break down. However, this information is often very difficult to get when it comes to a highly customized machine. In addition the exact impact of activities to improve the operation of a machine is often not fully predictable for the manufacturer

(Shafiee/Chukova 2013). Besides the technical expertise also social skills are important for the success of this service (Benz/Scheiffele 2001; Rainfurth 2003). However, a good relationship is for this service an important precondition to generate value for both parties (Kuhn et al. 2006).

3.2 Service-hotline

Using a service hotline offers the customer to contact the manufacturer via phone. The person at the phone is often either the technical expert or matching the type of the problem with the corresponding expert (Rainfurth 2003; Zborschil 1994). The problem solving procedure depends on the type of the problem and the competences and resources at customer site. The disturbance might be solved via instructions on the telephone, a service technician has to be sent to the customer or spare parts will be sent and the customer personnel do the repair following the received instructions (Koch 2010).

Benefits for the customer lie in a high availability of the machine as when problems occur the problem might be solved right away with help from skilled personnel of the machine producer. *Benefit* for the manufacturer is to guarantee the customer a basic level of support. This service thus promotes the sale of the investment good. The costs for this service are mostly covered within the purchase price, so mostly no additional service fee does occur (VDMA 1999). *Requisites* for the manufacturer is to have enough personal present during service hours (Kuhn et al. 2006) covering the required technological expertise, e.g. service technicians and mechanical engineers (Koch 2010).

3.3 Spare parts

This service comprises the provision and delivery of spare parts for the machine. Customers having technical skills present can with a sufficient technical documentation order spare parts from the manufacturer or from the parts or component supplier itself. Depending on the source – manufacturer of the capital good, parts supplier, parts reproducer, second-hand dealer, free suppliers – and the type of parts – original, reproduction, recycling or second-hand – differences in qualities exist (Baumbach 1998). The original producer mostly delivers a higher quality because of having the right specification, manufacturing equipment, materials and subsequent improvements have been made (Baumbach 1998). The consequences of spare parts with a lower quality can be a higher usage of resources, insufficient performance and higher risk of a break down all resulting in higher costs. These consequences allow the original manufacturer of the machine to ask for premium prices (Baumbach 1998). The profit margins are often much higher than the margins achieved with the sale of the investment good (Rainfurth 2003). Additional activities to be offered herein can be the offer of a digital catalogue for spare parts.

Benefits for the customer to buy from the original machine manufacturer is a reduction in the risk of a break down and due to the special expertise a reduced time needed for the exchange of the part. By using an electronic catalogue customers can save time and reduce the risk of ordering wrong parts (Baumbach 1998). Manufacturers can also offer to take over the distribution of spare parts which means for the customer a reduction in storage cost and carrying costs (Baumbach 1998). But as a downside customer reduce their freedom in decisions. By offering this service manufacturers *benefit* through protecting this profitable business against competing parts producers. Compared to the storage at each individual customer the aggregated storage at the manufacturer often allows for cost savings that can be passed on to the customer (Baumbach 1998). Taking over the whole spare parts management is a source of additional sales and can lead to a closer relationship with the customer. When customers outsource the complete spare parts management this means the manufacturer is responsible for the right timing of the ordering and distribution. *Thus the requisite* for the manufacturer is a fast delivery of the right spare parts. To achieve this a consignment warehouse could be build, critical spare parts can be stored at the customer or a flexible supplier network can be established (Baumbach 1998; Zborschil 1994). However customers often order directly from the parts producer to save the markup on the price (Reichert 2007).

3.4 Training

Training for the customer's operating personnel is often organized after the start-up of the machine and before the operation of the machine (Koch 2010). Content of the training are functions of the machine, using the machine, construction, working method, performance, software and safety instructions (Zborschil 1994). There is also a legal obligation to explain how to use the machine without endangering yourself and to warn of dangerous situations (Forschner 1989 with reference to Ahlert/Flocke 1982). The content of a training can go beyond a basic level for instance with an extra module on using a specific software. These extra modules are mostly customized to the individual customer needs having the aim of exploiting the full potential of the machine. The training session can be at the customer, at the manufacturer or done remotely via the internet. Subsequent training is needed when the machine has undergone technological changes or improvement (Zborschil 1994) or the customer sees a need for training because of new employees (Baumbach 1998).

Benefit for the customer is that trainings facilitate and speed-up the familiarisation of the operating personnel, offer guidance towards an competent self-maintenance and give a feeling of safety and competence in using new products or technology and by this also fun in using the product (Rüdenauer 1988). Furthermore the training by experts allows exploiting the full performance potential of a machine. Costs that apply are the course fee and the costs for the working hours spent for the training and possibly travelling costs (Baumbach 1998). Also there is an indirect effort caused by scheduling when different employees have to take part in the training. *Benefit* for the manufacturer is that the relationship to the customer can be intensified especially to those customers doing the maintenance on their own (Baumbach 1998). A competent training strengthens the conviction onto the capabilities of the manufacturer (Rüdenauer 1988) may result in new and/or more comprehensive product or service offers. Customer training facilitates to collect information of user specific problems, their needs and statements towards competitor products (Rüdenauer 1988). It *requires* from the manufacturer to have personnel equally skilled in technical competences as well in communication skills and the capability to transfer this knowledge.

3.5 Modernization

Constant technological change creates a demand for retrofitting services or modernization services which allow to use a machine for a longer life time as it is adjusted to state-of-the art technology and to achieve efficiency gains of existing machines. In addition the demand for these kinds of services is pushed by shorter product life cycles from customers (Reichert 2007). Providers for these services can be the original equipment manufacturer or specialized service companies. Retrofitting services can be manifold e.g. additional measurement sensors for tools or the workpiece, ex-post installation of CNC-PC communication, substitution of old CNC (Computerized Numerical Control) with a new generation, ex-post tool cooling or automatic tool changer. The actuality of an efficient use of resources and energy pushes the importance of retrofitting for old machines, e.g. that a machine turns automatically into stand-by (DMG/Mori Seiki 2013). When substantial reconstruction activities were done adjustments concerning the software are often needed. Software up-dates, e.g. the applicability to other operating systems can also be grouped under modernization services.

A *benefit* for the customer lies in a higher performance respectively higher productivity of the machine. Modernization services target to get the optimal functionality within the production system of the customer and are based on the detailed knowledge of the manufacturer. This is because the manufacturer is often better informed about new developments in production technology. Improvements are mostly already incorporated in newer generations. In addition the modernization of an existing machine can often be done faster and cheaper compared to order a new one (Springfeld 2011; Wagner et al. 2010). Modernization strategies also value the emotional boundary to machine that worked well for a long time. Modernization services not performed by the original manufacturer can lead to a higher effort. But due to the interconnectedness of mechanical and electronic components often additional experts e.g. NC producer or IT experts are needed. In addition to the costs for working hours and material customers have to bear the stop of production during the modernization. When

substantial changes were made there might be also the need for an additional training. But modernization can bring for the customer savings in quality and operating costs. Retrofitting or modernization activities are mostly handled in a separate contract and thus transaction costs apply. Customers have to handle the uncertainty if the expected improvements are really met. Thus customers have to trust in the expertise of the manufacturer and proportionality of the resources applied by the manufacturer. A *benefit* for the manufacturer is the image as a technical expert. Successful modernization services transfer the reputation of a company that keeps pace to the actual state of the art in production technology. Based on this manufacturers can foster their position as a solution provider for the customer and thus strengthen the relationship to this customer. A major risk for the manufacturer applies when the modernization service required is a completely new task and hardly any past experience can be applied. Also the modernization of a machine most often substitutes the sale of a new one.

3.6 Process optimization

Consulting services, such as process consulting, aim to optimize the production processes of the customer company. Concrete targets can be a higher flexibility of the production, improved energy efficiency or improved availability of the machine. The already discussed implementation of an electronic spare parts catalogue or ordering system can also be seen as process optimization activities (Schniering 2009). Service providers can be external consultants or original manufacturer. Large manufacturing companies often have a wide portfolio and specialized business units for optimization activities they offer (Siemens 2013). Small and medium manufacturer often provide these services via the technical customer service (Zborschil 1994; Baumbach 1998) mostly executed during inspection visits (Baumbach 1998). The technical customer service can give information on the optimal use of the machine and in addition modernization services can be offered at this point (Rainfurth 2003, Baumbach 1998).

A *benefit* for the customer lies in the access to external expertise. Consulting services mostly target the technical features of the machine whereas optimization via software e.g. the introduction of a manufacturing execution system (MES) is mostly not offered by the manufacturer. However big companies do offer own software tools or systems and offer for these consulting services. Customers can achieve savings in quality costs e.g. reduction in waste, in operating costs, e.g. reduced energy use and in maintenance costs, e.g. via timely acquisition of new machine. Consulting services by the technical customer support are hardly priced separately consulting services by a specialized company or business unit are individually priced (Rainfurth et al. 2005). However customers have to face the uncertainty if the agreed activities will bring the expected improvements. To agree in advance on measurable parameters which have to be achieved is of utmost importance. An already established relationship and positive experience with the supplier can decrease this uncertainty. A benefit for the manufacturer can be seen when consulting services by the technical customer service result in getting the order for executing technical optimization activities (Baumbach 1998). Technical optimization and modernization belongs to the core competences of the manufacturer (Grill-Kiefer 2000). Besides the technical knowledge an intimate knowledge of customer operations is a requisite to propose suitable improvements. The successful offer of this service for a manufacturer depends strongly on the service technician. A competent consulting requires technical expertise as well as marketing competences to communicate and explain activities and benefits for the customer. It is important to define in advance measurable parameters to be met by the optimization activities. This means to identify current parameters concerning the availability of the machine and the total productivity and based on that estimate possible improvements. Already applied MES systems or shop floor system can for example provide performance data of the machine (Ciupek 2011).

3.7 Disposal

At the end of the life-cycle manufacturers can provide services for the disposal of the machine. Legal obligations in the disposal have to be considered. However the disposal is often handed over to special service providers (Azarenko et al. 2009).

Benefit for the customers is to hand the activities over to a company familiar with legal obligations concerning the disposal of materials and technologies for e.g. recycling the resources. Depending on the machine the recycling or disposal can be very complex (VDMA 2012). Manufacturers of machines have to provide the information how to dispose the product to the customer (European Parliament and Council 2009, in force since 20.11.2009). Though having the information the customer saves time and transaction costs by outsourcing these activities to a specialist. Cost savings apply mainly for the disposal costs (Weber 2006). However these costs and the related savings vary according to what is done with the machine scrapping or refurbishing or recycling of components. *Benefit* for the manufacturer lies in the refurbishing of the machine and the sale on a second hand market or the refurbishing of components or parts which can be used as spare parts (Haar 1999). However the refurbishment for the machine or parts has to be economically valuable for the manufacturer. If special technologies or instruments are necessary actors such as the original provider for parts or specialized recycling companies, sending parts or components to these actors would be an attractive option (Azarenko et al. 2009). The disposal has to follow the legal restrictions for environmental safety. The sale of the machine on the market for used machines can be done by the manufacturer or an external dealer. If manufacturers decide to offer the machine on an own platform investments have to be made before e.g. to establish the platform and to communicate the possibility to buy a second hand machine. Another option is to place the offer of a used machine through the service technician. For the refurbishing of used machines for the resell costs for the disassembly, logistics, stockage, energy, space, cleaning, test of functionality or certifications apply that have to be covered by the price on the second hand market (Haar 1999). Especially when bringing used machine again into the market it has to be drawn attention if new legal requirements have to be met.

4 CONCLUSION

The contribution of this paper is to give a summary of the benefits for the customer as well as of the benefits and requisites for the manufacturer in the machine building industry. Industrial services are an important unit for research. Gebauer et al. (2010) for example take specific industrial services amongst others to characterize different service strategies. Also the development towards a solution provider can be described via a phased model in which different phases are represented by the cumulative integration of individual services (Meier 2004). However, the provision of industrial services is subject to continuous change. Especially through the use of information technology efficiency gains can be achieved or new service types such as an electronic spare parts catalogue can be offered. Hence this paper aimed to give an overview of current research on industrial services and to serve as point for reference on the next generation of industrial services. As this paper presents a preliminary study in the next step a comprehensive and structured literature review on industrial services by investigating international literature has to be carried out in order to analyze differences such as in the number or types of services offered or in the provision in different regions.

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BUSINESS MODELS, VALUE CREATION AND CUSTOMER RELATIONSHIPS

DIGITAL SERVICES AND VALUE CO-CREATION IN THE MUSIC INDUSTRY

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ABSTRACT

New channels are appearing in the music industry sector which open up ways of more deeply involving customers in the processes and activities related to and surrounding music purchasing. These processes where value is co-created link multi-organizational resource combinations (firms, customers, platforms). A review of literature generates a set of hypotheses. Quantitative analysis explores the role of the participants and the mediating effect of link channels in the process of co-creating value in the music sector. A survey provides 4,227 valid questionnaires for a sample of respondents located in the United Kingdom. Structural Equation Modeling (SEM) tests the hypotheses. The results emphasize the importance of managing customers according to their attitudes, and confirm the hypothesis that link channels have a mediating role in value co-creation in the music sector. Also the role participants' play is clarified, with services transforming the perceived role of customers from operand to operant resource, making customers a source of competitive advantage.

KEYWORDS: Co-creation, Link channels, Customer attitudes.

1 INTRODUCTION

Traditional manufacturing firms are increasingly involved in a servitization process (Vandermerwe and Rada 1988), changing their patterns of value realization away from a focus upon goods-centric value towards a service value orientation (Baines *et al.* 2009). Within this approach the customer becomes an essential resource. Individual interactions enabling customers to co-create value with firms are becoming new sources of competitive advantage (Vargo and Lusch 2004) yet understanding the consumer needs quantitatively is underexplored in the literature on business servitization (Nudurupati *et al.* 2013). Link channels are the points of interaction between customers and the firms' front office where co-created value is experienced and most visible (Bustinza, Parry and Vendrell-Herrero 2013). For effective value co-creation to be realized an understanding of the role of link channels is required (Mills, Parry and Purchase 2011).

Novel research will be presented that analyses the role of link channels, acting as enablers in the process of value co-creation in the music industry. Whilst a number of studies of supply chain

management practices across different industrial sectors have been undertaken, but the creative industries – cultural, artistic and entertainment – have not been extensively explored (Wong, Arlbjørn and Johansen 2005). The music industry has been involved in a process of servitization, exploring numerous opportunities to generate revenues from interactive services which enable value co-creation (Parry, Bustinza and Vendrell-Herrero 2012). Graham *et al.* (2004) argue that the transformation of the supply chain in the music industry is due to the appearance of these digital products. They foresaw a decline in the dominance of the major companies in the market as the arrival of music as a download bypassed the established industry supply chain. As a result numerous firms found themselves losing control over their market, distanced from their customer base and even displaced completely from the value chain (Bustinza *et al.* 2013). As music moves towards more service oriented models of delivery, music distributors are exploring suitable alliances with exclusive platform producers in order to retain market position, revenues and regain a degree of control in the value chain (Swatman *et al.* 2006). Although a body of research has analyzed upstream supply chain management far less is to be found with a focus upon downstream value chain operations management (Vandermerwe and Rada 1988; Singer and Donoso 2008).

The research presented here analyses the competitive landscape for the supply of music and the related music industry strategies for engaging customers in the value co-creation process. Quantitative data is used to provide explanation and validation for the major music companies' focus upon development of music based services. Explanations are provided for the strategy of platform service providers who are trying to establish complete channel ownership, from hardware, through software platforms and out to the subscriber base. Analysis presents the most beneficial strategies available to music rights holders with regard to their presence in one or many of the possible music link channels.

A model establishes customer attitudes, the methods consumers use when discovering new music and the associated role link channels play. The remainder of the paper is structured in four parts. First a theoretical background is introduced leading to the statement of hypotheses and a model plot. Second, an empirical analysis is carried out drawing upon a sample of more than 4,200 respondents from a music firms UK dataset. Results and discussion are presented in part three. Finally, the fourth part presents the conclusions, main findings, implications, limitations and opportunities for future research.

2 THEORETICAL FRAMEWORK

2.1 Music industry supply chain management

A supply chain approach implies that organizations move beyond competing with short-term propositions and look for co-operative partnerships that establish long term networks of suppliers and customers (Choi and Kim 2008). The network typology based upon an organizational structure model illustrates this structure as having separate strategic apexes, but a joint operations core (Nassimbeni 1998). Whilst this model was developed for materials flows, in this work the construct is applied to the product/service supply network. The business objective is to achieve operational synergy between the partners; the model focuses attention on the operating core; integration is realized in the materials/services flow. This operating core is a site of co-production and represents a centre of value co-creation (Prahalad and Ramaswamy 2000).

Supply chain operations management involves customer relationship management, customer service management, and product development and commercialization (Cooper and Ellram 1993). These sub-groups form the basis for the development of customer-driven strategy related to efficient supplier operations, corporate objectives and service and manufacturing functions (Berry, Zeithaml and Parasuraman 1985). This paper presents an analysis of supply chain management and supply strategy in the UK music industry with particular focus on consumer attitude as a driver, and includes an overview of the strategy, structure and infrastructure elements required of the link channels which form the supply network interpretation (Andersen and Christensen 2005). According to Parry *et al.* (2012) four main distinctive characteristic attitudes are present in the consumers for the UK music industry sector: Explorative Consumers who are always looking for new music; Early Adopters who closely follow fashions; Cautious Consumers who do not prioritize music in their lives; and Band Fans who purchase the releases of their favorite acts. Utilizing a large consumer survey, the analysis looks

at the link channels employed which define the new business models firms employ for value creation with partners and customers (Amit and Zott 2001).

2.2 Co-creation and new link channels

Co-creation requires customers to take up an active role (Lovelock and Wirtz 2004) and makes necessary more open communications between customers and producers. Under this paradigm the traditional industry view of the passive customer needs to be revisited in order to change from a value creation to value co-creation perspective (Prahalad and Ramaswamy 2000). Customers are important resources who are activated in the co-creation process and firms must develop new platforms where this interactive process can be more effective in engaging and exploiting the active customer as an asset in value creation. Multi-billion dollar platform service producers are pioneers competing to become dominant in these new link channels, developing vertically integrated hardware and software offerings for the market such that they are not visibly reliant on other branded firms. This business model is called Platform as a Service (PaaS) and may be described as an *integration oriented* product service system (PSS) where the supplier extends their vertical integration, seeking revenue gain from every level in the supply chain (Neely 2010).

The main PaaS providers are currently able to offer the vertically integrated software and hardware package required by consumers to access music new cloud services. To offer the music requires the consent of the music publishing rights holders. PaaS providers require all the rights holders consent to offer a broad range of content and failure to secure their joint patronage may cause their offering to fail. Music distributors, as content providers, have to be present on one or all of these PaaS to retain access to the broad music market. Therefore a strong interdependency and value co-creation aspect exists in the relationship between PaaS and content provider. In partnering the music rights providers may regain some of their previous market position as the PaaS providers need the music industry content and the providers hold the rights to these resources. PaaS creates a channel where services designed to stimulate interactivity permit and enable the development and offering of value co-creating services with customers. Through a change in business perspective as well as exploitation of technological capability, customers become operant resources within the new PaaS model (Prahalad and Ramaswamy 2000). The service may be defined as a systemic configuration of the product where the interactions between operant resources are coordinated strategically, generating value co-creation opportunities.

The music industry has seen revenues fall over the past decade and the new opportunities presented by PaaS may provide a return to the revenues that were previously realized (PriceWaterhouseCoopers 2010). Engagement of customers in the co-creation of value through PaaS requires that firms understand customer attitudes towards purchasing music, co-creation and particularly how they perceive and are disposed to engaging with PaaS channels. Previous work identified that approximately half of consumers displayed a positive attitude towards co-creating value (Parry *et al.* 2012). However, the reasons behind this positive attitude are not understood and this work explores how and if the link channel may be employed to stimulate a positive attitude towards value co-creation. This is undertaken by studying the role played by link channels and analyzing customer attitudes to different methods of purchasing music as channels might act as mediators, driving consumer behavior.

2.3 Hypotheses development

In the music industry, competition occurs not only between firms but between service supply networks. Digital market service providers operate in scenarios where competitors may rapidly establish the detail of a firms service design principles and therefore rapidly create contingent models. In a context like this, competitive advantage comes exclusively from structural factors such as privileged access to channels and the appropriate management of them (Wiertz *et al.* 2004). In this case strategic choices appear to play a secondary role. However, under a production and operations management perspective, the alignment between priorities and capabilities is a crucial enabler for competitive positioning (Schoenherr and Narasimhan 2011). The effective allocation of resources is determinant of competitive advantage (Grant 2009). The combination of resources determines the

formation of competencies and capabilities in a dynamic process, supporting the competitive advantage obtained (Barrales, Bustinzá and Gutierrez 2013). This dynamic process can be observed in the co-creation scenario (Prahalad and Ramaswamy 2000).

When SCM focuses on consumption issues, consumer responses need to be analyzed. Increasing customer service is one of the objectives in this framework (Kotzab 1999), allowing enhanced consumer value in the co-creation process. Mitchell (1997) reports that some of the main characteristics of consumer analysis initiatives are a closer working relationship between firms and customers, and a search for win-win solutions in the relationships established. All those characteristics can be found in the music industry. If one of the goals of consumer analysis is to provide them with the products and services they want, and the link channels are part determinant of the relationship between music distributors and those consumers, the following hypotheses are relevant:

Hypotheses H1: Consumer attitude to music co-creation methods is due to the mediation effects of traditional link channels (H1a) and modern link channels (H1b).

Hypotheses H2: Consumer attitude to push methods is due to the mediation effects of traditional link channels (H2a) and modern link channels (H2b).

Having stated the hypotheses, a model of relationships is developed, shown in Figure 1.

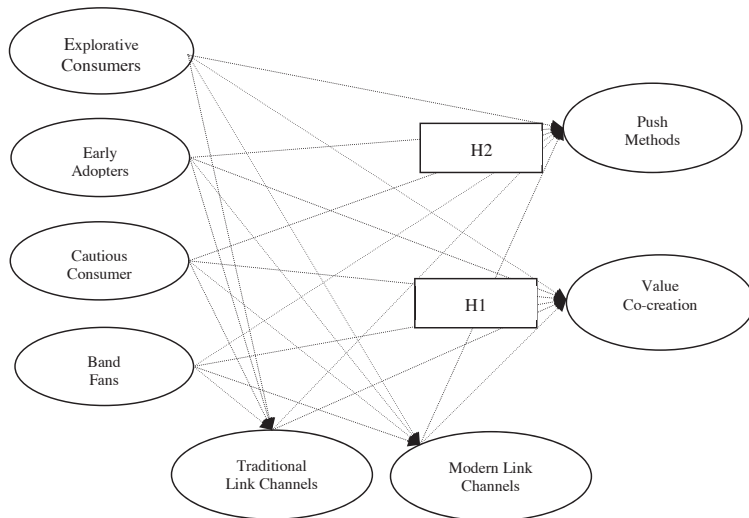


Figure 1: Relationship between customers attitudes and discovery methods mediated by the effect of link channels

3 METHODOLOGY

3.1 Sampling procedures

An empirical investigation was carried out to verify the hypotheses stated in the present study. Servitization and supply chain strategies can be better analyzed with a collection of consumer information, or linked data (Uren and Brewster 2013). The consumer population selected is made up of resident music consumers in the UK. The statistical software SPSS 20.0 and EQS 6.2 is used to analyze the data included in the sample.

The questionnaire and responses were provided by one of the Big 3 global music companies. The questionnaire has been undergoing iterative development for a number of years within the company's market research division. The questionnaire is extensive and the researchers selected a subset of questions directly relating to the attributes and characteristics of consumer behavior relevant to this

study. The subset selected is subsequently validated by industry experts for coherence. Obtained were a total of 5,101 valid questionnaire responses. Through a 4 groups Cluster k-means analysis, a total of 4,227 respondents are categorized under a specific consumer group (Explorative Consumer, Early Adopter, Cautious Consumer and Band Fan). All findings were fed back during both a teleconference and a physical workshop to industry experts and have been validated.

3.2 Main scales

Music consumer attitudes and Discovery methods: These scales are made up of items in the questionnaire which use a 5-point Likert scale (1= Total disagreement, 5 = Total agreement). The scales identify the four distinct characteristics of music consumers established by Parry *et al.* (2012). Link channels: As with the scales analyzed above, a scale composed of a 5-point Likert from Bustinza *et al.* (2013) was used to group the main link channels in the music industry. The analysis of the scale's internal consistency yields values for Cronbach's alpha, Mean inter-item correlation and Composite reliability that confirm the instruments as valid for measuring the latent variables selected.

4 RESULTS AND DISCUSSION

The hypotheses are tested through this model to examine the extent to which link channels are determinants of consumer attitudes to active and passive discovery methods (Table 1). Mediation effects are marked in bold, a discussion is presented below.

Table 1: Acceptance/Rejection of Hypotheses

	Explorative Consumer	Early Adopter	Band Fan	Cautious Consumer
% of market with this attitude (Parry <i>et al.</i> , 2012)	15,77%	21,22%	20,41%	42,60%
Traditional and Value co-creation	Total mediation H1a: 0.01	Total mediation H1a: 0.03	Total mediation H1a: 0.05	No effect H1a: -0.09***
Traditional and Push methods	No effect H1b: 0.23***	Partial/No effect H1b: 0.16***	Partial/No effect H1b: 0.18***	Increased H1b: 0.23***
Modern Channels and Value co-creation	Inverse H2a: -0.11***	Total mediation H2a: 0.01	Total mediation H2a: 0.05	No effect H2a: -0.09***
Modern channel and Push methods	No effect H2b: 0.29***	No effect H2b: 0.21***	No effect H2b: 0.21***	Increased H2b: 0.25***

Note: No effect – no mediation effect; Total mediation – attitude determined by mediator; Inverse – attitude inverted by mediator; Increased – attitude reinforced by mediator.

Level of statistical significance: *** 1%, ** 5%, * 10%

4.1 Implications for theory

The results are consistent with the underlying theory and contribute quantitative evidence to explain the dynamic process of value co-creation and the role played by the resources involved (Grant 2009). If the integration of consumers in the co-creation process is effective they become a source of competitive advantage (Prahalad and Ramaswamy 2000). To understand the integration of consumers as a resource for competitive advantage requires first an understanding of consumer attitude. Gaining an understanding of consumers based upon their attitudes allows a firm to make best use of their resource by targeting those groups who are amenable to involvement in co-creation processes. Following categorization by attitude, firms will be able to signal or offer appropriate environments for their different consumers, making a more efficient assignment of resources and preventing unrealistic expectations of the engagement of their diverse customer base. Some consumers are operant per se in a co-creation scenario, actively seeking involvement and to contribute their resource, whilst others remain stubbornly operand minded in all environments, wishing only to engage in transactional

exchange. The attitudinal nature of consumers and the related affect this has on engagement and value co-creation provides the main contribution of this paper. Further, firms must understand that, after categorizing consumers, they have a responsibility for designing offerings which involve groups of consumers appropriately in different value co-creation processes.

4.2 Implications for practice

With regards implications for practice, firms may reconsider their approaches to consumer engagement through both traditional and modern link channels. The results show that 57.40% of the consumers (categorized by attitudes as Explorative Consumer, Early Adopter and Band Fan groups) demonstrate a positive attitude to engagement in the co-creation process managed by firms, B2C, when they are faced with traditional link channels. This percentage decreases to 41.63% when the consumer groups are faced with modern link channels. This reduction is due to the Explorative Consumer group who do not appear to like to be induced into a co-creation process in modern channels. They are positively disposed to being operant, but would appear to only self-enable this process. This grouping provides evidence of a C2B model in the co-creation process associated with Explorative Consumers using Modern link channels. The Cautious Consumer grouping, representing 42.60% of the sample, does not yet have a positive attitude towards involvement in the co-creation process. Marketing music too them may increase their engagement with music, but they remain as a passive consumer, regardless of link channel and do not engage actively in co-creating value.

The mediation effects analysis results show that consumer attitude to co-creation is not an attitude per se; but is instead due to the action of the link channels. This means that co-creation is driven by link channels and the channels ability to give opportunity for consumers to engage, converting them from operant to operant resource. The greater the numbers of channels music distributors are present in, the greater the opportunity to engage those with a positive attitude towards value co-creation. This is important when selecting partners in the PaaS market (Apple, Google, Microsoft etc.) as the result demonstrates that being present in all link channels may be an advantage for distributors as their presence broadens the potential opportunity for them to drive consumers towards engagement in co-creation processes.

5 CONCLUSIONS AND FUTURE LINES OF RESEARCH

The results support the importance of co-creation of value as a future determinant of success for the rights holders in the music industry (Prahalad and Ramaswamy 2000). Co-creation can contribute to music firm revenues only as long as the consumer attitudes are positive to these kinds of processes. Firms must therefore categorize their consumers into groups according to their attitudes. Some of these groupings may be resistant to becoming active participants, operant resources in a service system (Vargo and Lusch 2004).

The music industry has valuable resource (content) which may be exploited by the developing integration oriented platform providers (Neely 2010). Partnering with all the players in this field may be useful, assuming that providers recognize that they are responsible for management of the process of co-creation of value with many of their consumers. Partnering with all players for co-creation supposes an open innovation approach and a way to recover valued consumer contact and hence revenues.

With regards main theories underlying this study, the results support the concepts that resources are a source of competitive advantage; in this case the right to distribute or sell music (Barrales-Molina *et al.* 2013). Controlling content or the link channels, which are a rare, unique and inimitable resource redounds on sustainable advantage. A consumer, in becoming an operant resource as part of the value co-creation process, is an important resource to be managed by firms (Prahalad and Ramaswamy 2000). The results support the music distributors strategies that involve them being present in all the channels associated with the new services (cloud services, personalized smart-phones applications etc).

The study has a number of limitations. The results were obtained using a cross-sectional or static analysis. Longitudinal analysis may clarify the dynamic nature of the co-creation process. The population studied is limited to the residents of the UK. To test the global potential of generalization

of the findings a further global analysis may be carried out as results may be country-specific. Despite the given limitations the study shows that latent consumer attitudes provide valuable insight for the music industry.

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SERVITIZED BUSINESS MODELS IN PROJECT-BASED FIRMS: THE CASE OF ENERGY EFFICIENT ARCHITECTURE

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ABSTRACT

Business models of project-based firms have traditionally been based on delivering value through the product. In the building sector, the customer perceives value only when it receives the finished building, at which point it terminates its relationship with the firm. New research strands on value in use and the employment of new business models lead us to propose the creation of new solutions that can include services as part of the firm's offering for the consumer. This proposal involves increasing both the value perceived by the customer and the benefits to be obtained by integrating all phases of the business, thereby achieving a lasting relationship with the customer. In the context of energy-efficient buildings, technological innovation and the particularities of design, installations, maintenance and use are presented as an ideal framework for studying the introduction of the phenomenon of servitization into the business models of project-based firms (PBFs). In this article, we attempt to evaluate how servitization gains a leading role in existing business models in this area. We will propose a structure for new business models in this sector and, through case study, examine what kinds of models are emerging. We will then analyse these models and propose improvements for integrating services into all phases of the business.

KEYWORDS: Servitization, Project-based firms, Case study

1 INTRODUCTION

It is becoming increasingly clear that today's companies are undergoing a change in their supply chains (Wise and Baumgartner 1999; Bustinza, Parry, Vendrell-Herrero 2013). This transformation occurs with the transition from a business model grounded only in the sale of products to a new model based on offering integrated solutions in a combination of products and services (Neely 2008). The creation of value by adding services to the product has been termed "servitization" (Vandermerwe and Rada 1988).

To date, the literature on servitization has focused primarily on the manufacturing sector (Baines *et al.* 2009). Clear differences exist, however, between manufacturing firms and PBFs. These include discontinuity of demand, complexity of offers, and individuality of the content and structure of each project (Cova *et al.* 2002). As a result, the role that the different elements in the business models of PBFs play differs from that of the manufacturing industry and remains unresolved in the general literature on servitization (Artto *et al.* 2008).

A gap exists in the literature on servitization in PBFs, and this research will attempt to contribute new knowledge of this area. The scholarly goal of this paper is to develop a framework to describe servitization in PBFs. Specifically we attempt to study how servitization affects business models that emerge in construction firms that build energy-efficient buildings.

We justify our focus on the growing implementation of the process of servitization in PBFs, as well as on the need to redefine the business model in the construction sector (Barrett 2005). These two

tendencies are altering the way firms obtain benefits, leading PBFs to face new challenges in business design and organizational structure (Brady and Davies 2004).

We also detect the presence of two factors in favour of servitization in the sector of energy-efficient buildings: consumers' increasing interest in the behaviour of investments during the life cycle of products (Stremersch *et al.* 2001) and the complexity stemming from technological innovation (Crespin-Mazet and Ghauri 2007).

This article attempts to respond to the following two research questions: How is servitization affecting the business models of PBFs in the area of energy-efficient buildings? And, what new business models are emerging in this sector?

2 LITERATURE REVIEW

2.1 Servitization

Servitization may be conceptualized as the transformation of a firm from a focus on selling products to selling complete solutions (Baines *et al.* 2007). Servitization is based on the emergence of bundles that combine services, products and knowledge to add value to the traditional firm offerings (Vandermerwe and Rada 1988). One of the main premises is customer orientation, rendered necessary by the inclusion of services in those bundles, and thus changing the widely used paradigms of value (Vargo and Lusch 2004).

As explained above, servitization is primarily customer oriented. The creation of value is understood through the eyes of the customer (Brady *et al.* 2005), changing the traditional view of value creation (Slywotsky and Morrison 1998). Service Dominant Logic also focuses on value generation, establishing that the customer acts as a co-creator of value and viewing goods as merely instruments for the delivery of services (Vargo and Lusch 2004). In this context, service operations must focus on strategies to match customer expectations with customer perceptions (Armistead and Clark 1993). The integration of services is a strategic tool that has been recognized as a source of sustainable competitive advantage (Cohen *et al.* 2006).

2.2 Business models

The business model can be described simply as the way that a firm sets its business strategy in motion (Chesbrough and Rosenbloom 2002). The literature provides many general definitions of the business model, many of which assume that this model represents the logical foundations of how the firm generates and captures value (Amit and Zott 2001)

The concept of the business model draws on various theories (Morris *et al.* 2005). Starting from the idea of value chain (Porter 1985) and strategic positioning (Porter 1996), business models comprise the architectural configuration at an operational level, and vision, value creation, network and alliances at the strategic level. Since business models seek competitive advantage based on configuration of resources, the RBV of the firm (Penrose 1959), the Knowledge-Based View (Grant 1996) and the Theory of Dynamic Capabilities of the firm (Teece and Pisano 1994) are applicable in this framework.

2.3 Project based firms

Project-based firms are firms structured around the projects they carry out (Gann and Salter 2000). This kind of business is developed in temporary organizations established to achieve a specific objective rather than through continuous manufacturing or service activities (Packendorff 1995). PBFs provide a unique solution for the customer (Hobday 2000).

Business performed through a project differs from other kinds of business, due mainly to the specific relationship to the context surrounding the project itself, time constraints, characteristics of value creation, complexity, the degree of uncertainty, and the minimal possibility of normalization of processes (Hellström 2005). Management of projects is performed independently (Hobday 2000), limited primarily by the contractual agreement with the customer (Turner 1999).

The importance of PBFs is more than justified; they contribute considerably to the GDP of the most advanced economies (Knight Wendling Consulting 2000).

2.4 Energy efficient buildings

The rapid growth in world-wide consumption is a problem that worries governments and citizens, due to the difficulties of supplying energy, the exhaustion of energy resources, and the strong impact of energy production on the environment (Pérez-Lombard *et al.* 2007).

The concept of energy efficiency in buildings is related to the reduction of energy consumption to the minimum needed to achieve desirable environmental conditions (Omer 2008).

Based on construction standards, the goal of these constructions is to achieve perfect climatization. These standards thus require a degree of supervision and feedback that are very interesting for considering the inclusion of specific services after execution of the building. It is worth pointing out that the conceptual phase of the design of a building is the best time at which to integrate all of the strategies geared to reducing energy consumption (Wang, Rivard and Zmeureanu 2006). This procedure indicates the value of attempting to obtain a business model that attributes great importance to the study and design stages.

Design of buildings based on energy-saving criteria reduces economic costs throughout the useful life of the construction, recovering the initial investment in a short period of time.

3 FRAMEWORK DEVELOPMENT

In what follows, we will draw on the relevant existing literature to propose a structure to ground servitized business models for firms in the sector of energy efficiency building. We will then analyse the importance of servitization in the model proposed through a series of factors that measure the impact of services in the development of the business.

It is important to note that developing business models based on services within PBFs requires abandoning the idea that value centres exclusively on the project-delivery phase (Davies *et al.* 2006). The project should be understood as a process that includes phases before and after the construction process and the customer's receipt of the building. It should find ways to add services to each of these phases, ensuring that the customer perceives value in each phase. Thus, a firm that supplies projects should study carefully what services to include during the different phases of the life cycle of the solution it provides (Artto *et al.* 2008).

Figure 1 illustrates our proposal for the business structure assimilable to PBFs in the sector studied here. In the figure, we can see three different phases in the development of the project over time. Each phase proposes the basic associated services that can be provided.

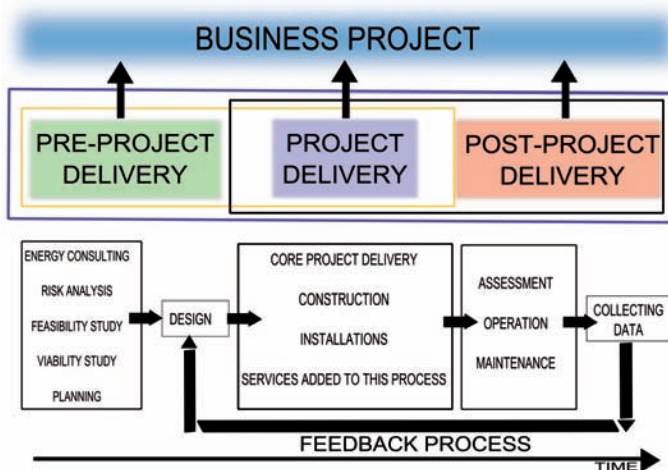


Figure 1: Framework for servitized business models in energy-efficient architecture

Pre-project-delivery phase: this is the first phase, in which the services involving the technical, commercial and economic viability of the project are developed (Ernst 2002). A good technical and economic study of the project will contribute decisively to the project's success (Blindenbach-Driessen and Van den Ende 2006), as it will enable the definition of more realistic goals and provide a better determination of the behaviour of the investment (Cooper 2001). We propose that this first phase include the services for planning and risk analysis, which will also contribute to establishing more precise deadlines.

Providing services in the pre-project phase will be important for the customer's conception of value. The more complete the initial studies, the more attractive the building will be to the customer. The capacities that firms show in this pre-sale phase take on significant importance in the case of PBFs as compared to other firms. They can become decisive factors in obtaining the success of the project (Blindenbach-Driessen and Van den Ende 2006).

Project-delivery phase: This is the phase that includes the essential activities of the development of the project: acquisition of materials, execution of construction, installations and some services added to the construction process itself, such as the preparation of reports on the evolution of the work and expenses incurred during its execution. This stage ends with delivery of the project to the customer.

Post-project-delivery phase: PBFs currently should tend to provide services beyond the project-delivery phase (Artto *et al.* 2008). The post-project-delivery phase thus includes all services that can be provided to the customer once the building is delivered. Services of evaluation, operation and maintenance will be especially important, since they are services that provide the firm with an incoming flow of capital that will fluctuate less and be more sustainable over time (Windahl 2004). The same services will also make it possible to collect basic data on the functioning of the building. Through management of the building, it will be possible to correct and improve designs and planning, increasing the efficiency of the final product and the general process.

Another issue to stress in business models of PBFs is that they are usually developed at the level that the customer requests for each project (Tikkanen *et al.* 2005). Generally, firms must offer different business models for the different consumers and markets (Chesbrough and Rosenbloom 2002). PBFs must therefore adapt their business model to the customer's requirements in each project, combining or individualizing the different phases when necessary.

Through the bibliographical review of services and empirical research with PBFs, Artto *et al.* (2008) identify six kinds of different types of impact that describe how services influence the business of a PBF. Since these issues were proposed in the context of PBFs, we consider them useful for analysing the degree of servitization of the model developed.

The following table (Table1) analyses these factors, showing the impact associated with each factor on the business model and proposing the associated services corresponding to each factor for firms in the energy-efficient building sector.

Table 1: Impact of services on business project for energy-efficient buildings.

Impact Type	Impact on the business model	Services Proposed
Customer Entry	Services to encourage customer to enter into the business transaction, thereby also becoming a potential customer for other services and projects in the future.	<ul style="list-style-type: none"> - Energy consulting - Free pre-designs - Risk analysis - Planning studies
Customer's Perception of Value	Associated services that increase the consumer's perception of value, making the product in itself more attractive, profitable and easy to manage.	<ul style="list-style-type: none"> - Energy consulting - Economic studies of profitability - Full management of the project
Delivery efficiency	Services suited as closely as possible to the customer's expectation for the final product, in this case, the building	<ul style="list-style-type: none"> - Design in collaboration with the customer - Technical and economic planning suited to the interests of both parties
Competitive advantage	Competitive advantages with the proposed model can be obtained from any of the phases by offering services that increase the attractiveness of the main product. The greater the quantity and exclusiveness of the services offered, the more difficulty the competition will have in imitating them and the greater the possible competitive advantage.	<ul style="list-style-type: none"> - Integration of all phases of the project. - Use of information from the post-project phase to improve the design and exploitation phases.
Services Business	Services as a source of own income. Services that have greater continuity over time and thus permit constant and predictable income.	<ul style="list-style-type: none"> - Consulting - Maintenance - Operations - Physical execution
Innovation and learning	Services associated with the building that permit increase in technical and operations knowledge, permitting the development of a process of continuous improvement in the business model.	<ul style="list-style-type: none"> - Evaluation - Operation of systems - Maintenance - Physical execution - Integration of phases

4 RESEARCH METHODOLOGY AND FINDINGS

The research adopted a single-case study approach to analyse the characteristics of the business models used and the organizational adaptation of the firm to the servitization process. This analysis will give us closer, more realistic knowledge of the current development of servitization in business models of companies from this sector.

The case study as research methodology can be defined as the empirical investigation of a phenomenon within its context (Yin 2003). This is a very effective tool when analysing complex processes that are ongoing and providing information for the development of new theories (Eisenhardt 1989).

Therefore, the research was qualitative and we gathered information through a structured interview with senior managers. The company studied is ASOMA, a Spanish architecture firm that bases its projects on criteria of sustainability and respect for the environment. The questionnaire, adapted from Mertens (2012), focused on analysing the organization of the firm and the characteristics of the business model used, with special focus to the inclusion of services in this model. In general, we can affirm that the firm studied is conscious of some of the advantages that the process of servitization can add to its business model. However, it is also clear that this firm has not yet developed fully the mechanisms and structures needed within the firm to achieve a fully servitized business model. The interviews confirmed a strategic step toward customer focus and customer satisfaction, seeking more fruitful and lasting relationships (Saxon 2002). Collaboration with the customer is sought, especially in the phase of definition of the project.

Another noteworthy aspect is that the firm includes added services especially in the pre-project-delivery phase, with the performance of studies of technical and economic viability, as well as studies that predict the return on investment due to energy savings. However, this procedure is not a matter of providing new services to the customer during the development of the project and the post-project-delivery phase.

The company is conscious of and confirms the advantages derived from providing a “full package” of goods, services, support and knowledge to the customer (Slack 2005). But at present, however, relinquishes the possibility of providing the construction and maintenance phases together (Lind and Borg 2010) and of obtaining competitive advantages through the feedback process defined in our structure, even though the firm recognizes and evaluates this process positively. We also see that the organizational structure should be redesigned to seek a greater focus on services.

Through the questions related to bids on projects, we recognize the current inadequacy of this process the phenomenon of servitization.

5 CONCLUSIONS

In this article, we have developed a study of the process of servitization in the business models of PBFs for energy-efficient buildings.

Has been observed a growing inclusion of services in all phases of the project, especially in the pre-project-delivery phase, in which additional services can be added in the areas of energy, technical and economic consulting that do not apply to sectors other than PBFs. Likewise, operations and maintenance services become more significant due to the special characteristics of this sector. In general, we can affirm that the process of servitization of business models of PBFs is beginning to be felt, although it is still in the development phase.

Through the case study, we observe how the business model currently most adopted by PBFs in this sector is one that provides services for the pre-project phase and ends with delivery of the building. However, based on support from the existing literature, we propose the advantages of managing the full cycle of the project (Slack 2005), including the post-project-delivery phase, which permits more stable income through more lasting services (Davies 2004) and the possibility of implementing improvements in future projects through the data obtained from the evaluation, operation and maintenance of this kind of building, what we call the feedback process.

6 MANAGERIAL IMPLICATIONS

We have proposed a structure adapted to PBFs, on which to ground the different business models that this kind of firm can adopt. During each of the phases, we propose the inclusion of the best services to encourage the development and exploitation of the project. We also recommend to establish a more direct and lasting relationship with the customer (Kujala *et al.* 2010), achieving a win-win situation in which the customer not only obtains a project fully adapted to his/her needs and aspirations but also knows the project's future behaviour, in both energy savings and investment.

Further, we have studied the impact of services within the business model in PBFs, identifying services that can be added to correspond to each impact factor. Knowing these impact factors is important to becoming more aware of the influence of services on the business model of PBFs, which

enables managers to develop new offers that attempt to improve the process and that are more attractive to customers.

We propose management of the “full package” as the ideal servitized business model for this sector and the model that can provide the best competitive advantages (Windahl 2004). Full management permits studying the project, involving the customer from the initial stages, and developing solutions together (Ernst 2002). The construction process will clearly work better if it is performed by the same company that made the design and previous studies, a process that also enables better planning, avoids delays and provides technical and economic viability with less uncertainty (Blindenbach-Driessen and Van den Ende 2006; Cooper 2001). In addition, the services related to managing the building once it is delivered will be enhanced by all of the prior knowledge from study and construction that the firm itself possesses (Bennett and Iossa, 2006). This procedure enables greater profitability for the customer and less likelihood of problems stemming from lack of information about previous stages.

The information coming from evaluation, operation, maintenance and diagnostic services becomes crucial for developing a feedback process within the firm to allow preliminary studies, designs and construction methods that are increasingly better adapted to the problems that typically arise. From the case study performed, one can deduce that firms in this sector should take the step to adopt structures that permit them to achieve the integrated management of projects. It is necessary gradual changes in operations and management with a paradigm change in the entire way of working to achieve servitization (Barnett *et al.* 2013). The firm must promote the capturing of customers more actively through services (Brentani and Ragot, 1996).

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A STUDY ON THE APPROACH OF THE SERVITIZATION OF MANUFACTURING BASED ON THE VALUE CHAIN

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ABSTRACT

Following the trend of economic globalization such as trade liberalization and finance internationalization, manufacturing in many countries is under massive pressure. To achieve more competitive advantage the manufacturing firms should change their business model like enhancing their cooperation with their supply chain partners, providing integrated products and services that deliver value in use. This paper seeks to fill a gap in the literature by presenting a study on the approach of the manufacturing servitization from the perspective of Value Chain. According to the understanding of the concept of the manufacturing servitization that it includes producer services and product services, this paper exploits the key factors which influence the value added target of the servitizing manufacturing firms. Then a valuation model of servitized manufacturing firm is provided. Through studying the existing manufacturing servitization examples, this paper provides some typical types of the value-added models of the servitized manufacturing firms. Meanwhile, based on the survey of the servitizing elevator manufacturers, a comparison of the servitization between the large elevator manufacturer and the small and medium-sized one is also studied.

KEYWORDS: Servitization, Value Chain, Elevator Industry, Comparative Analysis

1 INTRODUCTION

In recent years, the processes of economic globalization are greatly speeding up which are mainly reflected in the trade liberalization, production internationalization and financial globalization. Meanwhile, the environment and resources pressure are increasing, customer demand are growing complexity, and the science and technology such as modern information technology are developing rapidly. Therefore, manufacturing in many countries is under massive pressure. To achieve more competitive advantage the manufacturing firms should change their business model like enhancing their cooperation with their supply chain partners, providing integrated products and services that deliver value in use. Following the deep integration of advanced manufacturing and modern services, many new manufacturing model and service model appear. Through the manufacturing servitization, the manufacturing can effectively be transformed from the development model with high energy consumption, low value and high social costs to a new model which is mainly composed of knowledge, innovation and service.

Since the second half of the 20th century, the global service industry had a rapid development. At present, the proportion of service industry in the national economy of many developed countries has been more than two-thirds. The global economic gravity is shifting from the manufacturing to service industry. Many studies have shown that the growth of the service is due to increased demand for producer services. The producer services which belong to the typical knowledge intensive industry become the fastest growing part of the service industry in the developed countries. In OECD countries,

for example, foreign direct investment in service industry is significantly higher than the total manufacturing investment amount, and mainly focused on producer services such as financial services, business services, information services and etc. In recent years, the proportion of the added value of knowledge intensive services in the total added value of the service industry in developing countries also has a great growth, such as India, Brazil, Indonesia, China etc. Accompanying the development of service industry, profound changes have also taken place in manufacturing. Manufacturing value chain from the manufacturing sector extends to the service sector. A single value chain of the manufacturing firm shows a trend of shortening, through mutual producer services between different firms to achieve the target of efficient production and value innovation. The manufacturing and service industry is developing interdependently and interactively.

The academics all over the world carried out a lot of research on the trend of manufacturing servitization, service enhancement, service innovation and service management. But there are different understandings and opinions of the concept of the servitization of manufacturing. The research of the model and approach of the manufacturing servitization is not in-depth. This paper presents a concept of the manufacturing servitization from the perspective of Value Chain, then constructs a valuation model of servitized manufacturing firm through exploiting the key factors which influence its value added target. This paper also studies the value of the servitizing process of manufacturing firms, provides some typical types of the servitized manufacturing firms and compares the processes of the servitization between different firm sizes of the elevator manufacturers.

2 OVERVIEW OF PREVIOUS RESEARCH

In the field of manufacturing servitization, different countries have different expression on this research. The United States called it service-based manufacturing, the European Union called it collaborative design and manufacturing under the network environment, Japan called it service-oriented manufacturing and British scholar usually called it product service system. Australian Electrical and Electronic Manufacturers' Association pointed out that manufacture is not a core activity more and more, manufacturing includes a growing number of service activities, such as finance, logistics and communications etc. The term servitization is used firstly by Vandermerwe and Rada (1988). Stoughton (1999) proposed the concept of product service. IBM (2004) proposed the academic concept of the service science and engineering management which further promote the study of service. Baines et al. (2009) discussed the practical challenges of delivering integrated products and services. Neely (2009, 2011) analyzed the global trends of the servitization of manufacturing. Li (2010) put forward a new service-networked manufacturing model called Cloud Manufacturing.

The concept of value chain was first described by Porter (1985). To analyze the specific activities through which firms can create a competitive advantage, it is useful to model the firm as a chain of value-creating activities. The firm's value chain links to the value chains of upstream suppliers and downstream buyers. Rayport & Sviokla (1995) put forward the virtual value chain. Feng et al. (2008) analyzed the mechanism of producer services to the value of manufacturing.

Throughout the current research status, the focus in the field of manufacturing servitization is mainly around the following questions. First, why do we want to promote the integration of manufacturing and services? Second, what is the manufacturing servitization? Third, how can the manufacturing carry out the servitization? At present, the trend of integration of manufacturing and services has reached a consensus. The research results of theory and practice of manufacturing servitization emphasize the importance of the value of service, customer value, service value chain, enterprise value and value-added which have in common with the research ideas of the value chain theory and practice. However, currently the research of manufacturing servitization from the perspective of value chain is less. The focus is on the study of theories from macro perspective and some individual cases, but more research should be done on the servitized manufacturing firms with different sizes and sectors.

3 RESEARCH DESIGN

The goal of this research is to construct a valuation model of servitized manufacturing firm and compare the processes of the manufacturing servitization of different sizes and sectors. The

methodologies of this paper include literature research, case study and comparative analysis. In this paper, different types of manufacturing servitization case in the existing literatures were passed on to sort out the thinking, put forward several typical value-added models. Using the online information and gathering information by field exploring of the selected companies, this paper selects some companies as samples in the elevator industry with large scale or small and medium-sized to investigate their service-oriented path features and value-added model. Based on the survey data, the comparative analysis of the scale characteristics are studied for the same section of servitizing manufacturing firms. The research frame of the approach of the manufacturing servitization based on the Value Chain is showed in figure 1.

4 PRELIMINARY FINDINGS

4.1 Understanding the Concept of the Manufacturing Servitization From the Perspective of Value Chain

In some ways, the product is the carrier of service. In recent years, scholars all over the world have carried on the multi-angle research to the area of manufacturing servitization. They put forward several concepts such as service enhancement of manufacturing enterprise, service-oriented manufacturing, producer services, product service-systems, total solution of manufacturing enterprise and cloud manufacturing. At the same time, there are crosses among the concepts of the manufacturing servitization, supply chain management, customer relationship management, enterprise resource planning, knowledge management and value chain management. After the research of the related theory and application, we put forward the concept of the manufacturing servitization from the perspective of Value Chain. It includes the manufacture-oriented service (producer services stage) and service-oriented manufacture (product services stage). And it has the characteristics of integration of resources, knowledge innovation and value creation. This concept in detail will be explained comprehensively in the following model analysis.

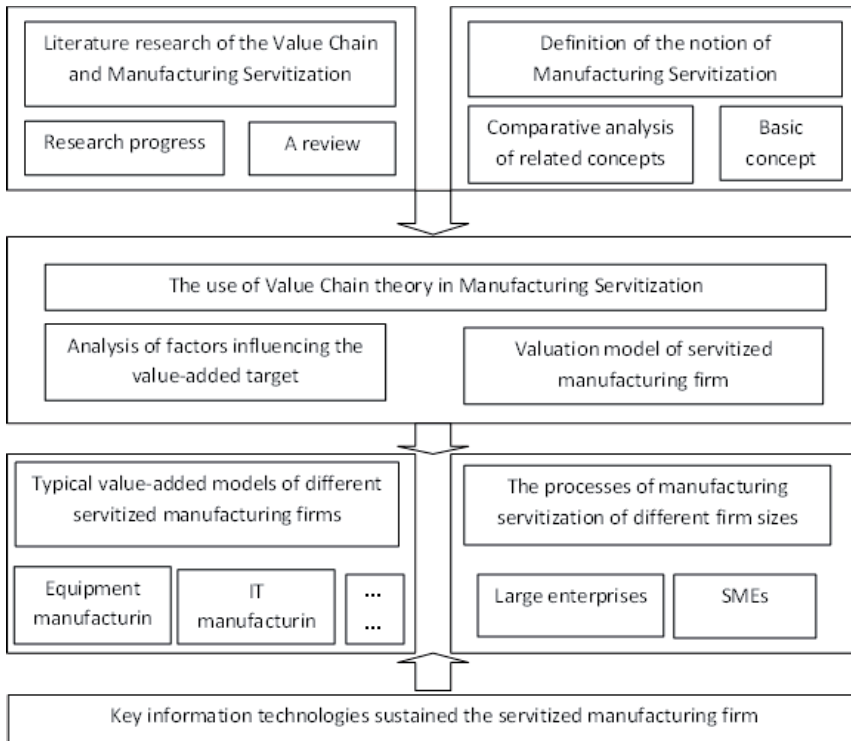


Figure 1: Research frame of the approach of the manufacturing servitization based on the Value Chain

4.2 Valuation Model of Servitized Manufacturing Firm

Due to the change of the service role, services become increasingly important in the value chain of manufacturing firm. The previous value of manufacturing enterprises is mostly from the production process, the increasing value now is mainly from the attributes such as advances in technology, style, features and product image created by the service (Quinn 1992). Based on the study of the characteristics of the value chain in the process of the manufacturing servitization, referenced the Value Chain (Porter 1985) and enterprise business systems valuation model (Copeland 1998), we put forward the valuation model of servitized manufacturing firm which is showed in figure 2. The manufacturing servitization includes the manufacture-oriented service (producer services stage) and service-oriented manufacture (product services stage). Producer services are mainly in the primary activities of the value chain such as product design and development, procurement and manufacture. Furthermore, product services are primarily in the primary activities of the value chain such as marketing, sales and after-sale service. The key value evaluation indicators of the primary activities of the value chain are also showed in figure 2. Financial accounting, human resource management and technology are the support activities of the value chain. Based on this model, this paper will analyze some typical types of the servitized manufacturing firms and carry on an empirical research of the servitization of elevator manufacturing firms.

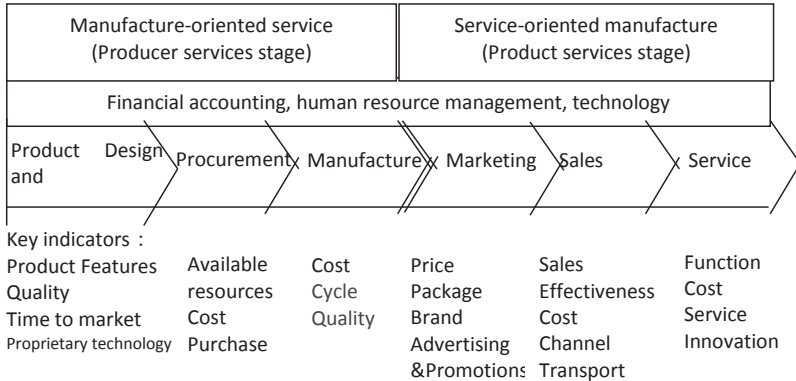


Figure 2: Valuation model of servitized manufacturing firm

4.3 Typical Value-added Models of Different Servitized Manufacturing Firms

Due to the characteristics and the upstream and downstream position of industries is different, the service-oriented manufacturing will show the different forms under the background of different industries, such as there is a big difference between the service-oriented manufacturing for terminal customers and service-oriented manufacturing for enterprises (He and Sun 2010). Research shows that the Value Chain of different industries has different characteristics. We passed on the different types of manufacturing servitization case to sort out the thinking, put forward several value-added models.

The first value-added model focuses on the servitization in the upstream of the value chain or input servitization. The enterprise mainly achieves the value added target through the producer service activities. The typical case such as the Rolls-Royce Motor Cars focuses on core technology such as engine manufacturing competitive strategy.

The second value-added model focuses on the servitization in the downstream of the value chain or output servitization. The enterprise mainly builds perfect product service systems to solve the customer problems. The typical case such as the Xerox transforms from the hardware manufacturer to the document photocopying services provider.

The third value-added model focuses on the servitization in the support activities of the value chain. The typical case such as the IBM transforms from the manufacturer to high-end IT services provider. But the classification of the value-added models is only relative. In Fact, most of the value-added models of the servitized manufacturing firms pay attention to the transition and transformation of the processes which cover the entire product life cycle. So they can improve their competitiveness through the full implementation of servitization strategy.

4.4 Empirical Research of the Servitization of Elevator Manufacturing Firms

In this section, according to the valuation model of servitized manufacturing firm put forward, we select elevator industry as sample, choice a servitizing large elevator manufacturer and a servitizing small and medium-sized one in China as the research object, analyze the processes of servitization of different sizes in this industry. The classification of enterprise scale is mainly according to the annual sales quantity of the elevator. The following questions are mainly discussed in this section. Which part of the value chain is the mainly value added point of the servitizing large elevator manufacturer? Is it in the input, output or support activities? Can the small and medium-sized elevator manufacturer benefit from the servitization? If it can, what is the value added point different from the larger one?

4.4.1 Value Added Analysis of the Servitizing Large Elevator Manufacturer

The transformation and upgrading from production manufacturing to service-oriented manufacturing is the important trend of global manufacturing. It is also the important approach for the manufacturing especially the group in China to increase product added value and go to the high-end of the value chain (Zhan *et al.* 2011). According to our survey of a servitizing large elevator manufacturer in China, the value added points of servitization are in many parts of the value chain.

In the upstream of the value chain, this firm mainly strengthens the using of the servitization strategy in the processes of product development design and procurement. As we know, the elevator is a highly customized special product. In this case, some of the product designs use remote monitoring function. When there is a glitch of the elevator, the remote data will be transmitted through the network to the elevator service stations, then service stations can diagnose and troubleshoot in time, and the effect of the elevator service is improved. Along with the increasing investment in product design of this firm, about 70% of its parts are adopted from the production outsourcing. When the elevator manufacturer designs the product according to customer orders, because the product structure and layout in different ways, in addition to some standard parts, some drawings of the parts need to be re-designed by the technical department of the elevator manufacturer, then the suppliers in the upstream can produce them according to the drawings. Therefore, the collaboration with their partners is highly required for the elevator manufacturer. How can the elevator supply chain partners realize the rapid response of the production through the rapid and comprehensive information communication? How can they coordinate the profit distribution to strengthen cooperation? These are the important issues of using the strategy of servitization.

In the manufacture process of the value chain, the producer services are also obvious in this case. Many manufacturing equipment, handling equipment and office equipment are all rented. It is important for the elevator manufacturer to optimize their value chain through the providing of producer services of their partners.

In the downstream of the value chain this firm mainly adopts the strategy of servitization such as outsourcing logistics and installation services, enhancing the elevator repair and maintenance services. With the development of the economy in China the elevator market demand gradually transform from the new elevator to after-sales service market, the demand of servitization of the elevator industry show a growth trend.

4.4.2 Comparison of the Servitization Between the Large Elevator Manufacturer and the Small and Medium-sized One

In China, small and medium-sized enterprises account for more than 98% of Chinese enterprise quantity, occupy 60% of GDP. In the elevator industry, SMEs play an important role at the same time. But they often face the problems such as the weakness of management foundation and the insufficiency of funds. Hence, under the background of manufacturing servitization, the research on the transformation characteristics of servitization of SME and value-added model also is of great significance.

According to our survey of a small and medium-sized elevator manufacturer, the cooperation with suppliers is similar with the large firm in the upstream of the value chain. The main difference is that the large firm will choose the high quality suppliers, and the small firm will choose some common suppliers in order to reduce costs. Moreover, the capability of product design of the small firm is not strong, mainly composed of imitation of the large firm. In the downstream of the value chain, the logistics and installation services of the small firm generally is also outsourcing, it is decided by the industry characteristics of elevator products. But due to the maintenance points of the small firm is less, a large part of the after-sales service business often is in the charge of their agent. Since the service quality of agent is uneven, this often affects the service effect of the elevator manufacturer. Therefore, in order to obtain competitive advantage in its service market the small and medium-sized elevator manufacturer need more coordination in many parts of the value chain.

By comparing the value-added model of different sizes in the elevator industry, we can see that the level of servitization of the large elevator manufacturer is much higher than the small and medium-sized one. According to the development experience of developed countries, the main profit growth of

the elevator industry in the future is based on the after-sales services. So those SMEs which have weakness in after-sales service will be easily eliminated by the market if they do not timely adjustment their strategy of servitization according to the variation of the market. Therefore, the small and medium-sized elevator manufacturer can demand more from the servitization demand and trends.

5 CONCLUDING REMARKS

In this paper, we define the concept of the manufacturing servitization from the perspective of Value Chain, put forward a valuation model of servitized manufacturing firm and discuss several different typical value-added models. Furthermore, an empirical research of some servitizing elevator manufacturer in China is pursued. It suggests that the large elevator manufacturer have adopted a servitization strategy to a certain extent, and the value added points of servitization are in many parts of the value chain. With the variation of the elevator market demand in China, application of the servitization strategy will be more comprehensive. At the same time, the servitization levels of the small and medium-sized elevator manufacturer are relatively low, the value added points of servitization are similar to large firm and it faces greater challenges in the new market competition.

Of course, there are many limitations of the research of this paper such as the choice of empirical research samples can also be wider and deeper. In future research, we can choose more sectors for comparison of the manufacturing servitization. We also can undertake the comparative analysis of the servitization model between developed countries and developing countries. The research on the valuation model of servitized manufacturing firm is also at the initial stage, it still needs more empirical data to optimize.

In addition, the manufacturing servitization has new requirements for information exchange and new information technology should be introduced. How can we construct the corresponding cloud manufacturing services platform by applying information technology such as cloud computing and considering the key technologies which sustain the operation of servitized firms? It is also a very important problem that we need to solve. For the limited space, this paper does not undertake the research of the information technology support system for the servitized firm. It will be one of our research emphasis in the future.

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SERVITIZATION: THE IMPACT OF CO-CAPABILITY ON RE-PURCHASE INTENTION

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ABSTRACT

Activities of purchase and use are separated by time (Shugan and Xie, 2000) and judged in two time-place forms – in exchange and in use (Ballantyne and Varey, 2006). Their separation creates uncertainty at purchase about the future value created in use (Shugan and Xie, 2000). Consider the decision to buy a service contract for capital equipment in which use could continue for ten years after the decision to buy. At the point of purchase, buyers may not be certain about the future state of use, i.e. whether equipment will fail, or indeed how the service will perform in the event of failure. While uncertainty about the state of use will continue across time, this paper finds customer-provider co-capability may resolve uncertainty about how the service will perform in use by mediating buyer perceived risk of re-purchasing service support contracts for capital equipment – an example of Product Service Systems (PSS).

It has been argued that PSS result in increased provider involvement in the customer's value creating processes (Windahl, 2007). What's more, joint ability of the customer and provider in the performance of these activities affects the outcome (Ng et al., 2013). It could be argued then that a strong co-capability reduces uncertainty in re-purchasing the contract with the same provider. Further, a positive experience in prior interactions reduces the perceived risk of future interactions and may increase intention to re-purchase. Through a web-based survey of 95 buyers of service support contracts for capital equipment, analysed using Partial Least Square Structural Equation Modelling (PLS-SEM), the authors show that strong co-capability reduces risk caused by the separation of purchase and consumption and increases the customer's intention to re-purchase.

KEYWORDS: Re-Purchase Intention, Capital Equipment Markets, PLS-SEM

1 INTRODUCTION

Marketing, and in particular industrial marketing, has argued that exchange between customer and provider is more than just the purchase transaction. The purchase is just one important interaction within a relationship that spans from 'pre-sale to post-sale service and beyond' (Ballantyne et al., 2011: pp.207). As a result, evaluation of inter-organisational interactions by both customer and provider involves three connected stages, each separated by time and space; the value proposition (i.e. pre-sale activity and judgement of offering 'goodness'), resource integration (i.e. post-sale experience of the offering in use) and value-in-use (i.e. post-sale judgement of 'goodness') (Ballantyne et al., 2011). This implies that evaluation of the value proposition at purchase is related to an expectation of resource integration in, and outcome of, the use experience. While Business-to-Business (B2B) marketing literature has identified relationships between the outcome of a use experience and the judgement of future value propositions through concepts such as perceived satisfaction, the relationship between the resource integration and the value proposition has been discussed by several authors but not yet extensively empirically explored (see Ballantyne et al., 2011, Kowalkowski, 2011, Moller, 2006).

In servitization, there is a clear recognition of the need for research into inter-organizational collaboration, or resource integration, in value creation and the development of collaborative competences which support it (e.g. Moller, 2006, Windahl and Lakemond, 2010). Particularly given PSS are often based on capabilities of the product, rather than the product alone, predicated a need for manufacturers to develop collaborations and partnerships with customers. Indeed, collaborative competences become more important when it is recognized that when level of resource integration between customer and provider increases, so does reciprocal interdependence (Windahl and Lakemond, 2010). One of the consequences of reciprocal interdependence put forward, at least for the customer, has been the suggestion of higher perceived risk at purchase. For the customer, servitization represents a change in the value proposition of the provider, resulting in a decision at purchase on whether or not to engage the provider in Value Creating Activity (VCA) in use. Involving the provider in VCA is argued to result in a loss of control and competence in value creating process for the customer (Windahl and Lakemond, 2010, Ng and Nudurupati, 2010), as well as, an interdependence between customer and provider that requires dyadic cooperation and coordination to achieve outcomes (Ng and Nudurupati, 2010, Bastl et al., 2012, Windahl and Lakemond, 2010). It may not be surprising then that research shows customer's do not necessarily desire increased VCA in the provider's value proposition (Ng et al., 2012). Essentially, as the level of VCA outsourced to the provider increases so too does complexity of the interface between the provider and customer involving a joint-coordination. This is thought to make evaluating expected outcomes at purchase more difficult for the customer, as a consequence increasing the perceived risk (Moller, 2006).

This leads us to consider the potential role customer-provider collaboration in VCAs might play in perceived risk at purchase. Research has shown that the joint ability of the customer and provider in the performance of VCAs affects the outcome performance (Ng et al., 2013). Further, it has suggested that in a buy situation the future collaborative process should increase perceptions of both potential value and risk, where positive experiences lead customers to assume that future experiences with the supplier will be positive reducing their uncertainty and having a positive influence on their purchase probability (Brown et al., 2011). These relationships have been proposed implicitly, and explicitly, but have not been empirically explored. In addressing this gap, we look at how co-capability at the resource integration phase (i.e. in use) effects future evaluation of the value proposition and therefore customer intention to repurchase. Thus, the following research question is posed: **How does perceived co-capability effect re-purchase intention for PSS?**

2 HYPOTHESIS DEVELOPMENT

Based on the discussion in literature above, we make the following hypotheses regarding customer intention to re-purchase PSS:

H1: The degree of VCA outsourced positively effects perceived risk of repurchase

H2: Perceived co-capability mediates the relationship between the degree of VCA outsourced and perceived risk of repurchase

H3: The perceived risk of repurchase negatively influences repurchase intention.

Thus, we propose that the degree of VCA outsourced by a customer (DoAO) influences their perceived risk of a negative outcome (PR), which in turn influences their repurchase intention (RPI). Further, this expected causal relationship may be mediated by the intervening variable of perceived co-capability (CC).

3 METHOD

In conducting an investigation of the hypothesis, we employ a quantitative method. In doing so, we measure all constructs by means of multiple items using five-point or seven-point scales. The process of establishing multi-item scales for each construct started with an investigation of the theoretical and empirical literature. Where possible, existing measurement scales validated in the extant literature are used. For instance, following Stone and Gronhaug (1993) PR was considered as a subjective expectation of loss and items were adapted from previous B2B risk literature (e.g. Mitchell, 1998, Mitchell et al., 2003); RPI is defined as a customer judgment on renewing a contract. As such, we adapt Hellier's (2003) multi-item measures to reflect the context of B2B service; and co-capability is defined as a co-productive ability created by relationship connectors that allow resources to be transferred between the customer and the provider. We adopt Cannon and Perreault (1999) relationship connectors to operationalise this construct, which have previously been used in servitization literature as a measure of the buyer-seller exchange relationship (e.g. Penttinen and Palmer, 2007, Bastl et al., 2012). Finally, the measure for degree of DoAO is also operationalized based on prior research. Specifically, we adopt the VCA's in PSS found by Ng et al. (2012), and Smith et al. (2012). To measure degree to which these are outsourced, respondents were asked to answer who performed each activity on a 5-point scale. An answer of 1 on the scaled was labelled 'Entirely by us', an answer of 5 was 'entirely by the supplier'. Therefore a rank of 1, has a low degree of outsourcing and 5 a high degree of outsourcing. Due to adaptations and modifications of some item scales, we performed content face validity of the items and scales with experts in the field.

The constructs of PR, CC and DoAO are conceptualized in this study as multi-dimensional. As a result, it is necessary to distinguish between (at least) two levels of analysis; one relating measurement items to lower-order dimensions, and a second relating those dimensions to a higher-order component (Jarvis et al., 2003). Following Jarvis et al.'s (2003) criteria, a formative-formative hierarchical component model is adopted for co-capability, in which lower order constructs in combination are a cause, rather than a consequence of the higher-order component (Diamantopoulos and Winklhofer, 2001), and reflective-reflective hierarchical component models for risk and co-capability.

The measures were entered into a web-based survey, which underwent pretesting before being distributed. A non-probability sample of respondents was chosen, known as purposive sampling, where the sample respondents were selected because of certain characteristics (Dooley, 2001). First, companies from industries were targeted based on their high spend on capital equipment, which represents an important context for exploring PSS (Töllner et al., 2011, Cova and Salle, 2007). The sample was further refined by targeting only those involved in procurement; this was due to their knowledge and involvement in re-purchase decision. To target these individuals, we used opt-in email distribution lists acquired on a rental campaign basis. The email campaign resulted in 95 usable responses. A Post Hoc test using G*Power (Faul et al., 2009, 2007) was carried out indicating a power statistic of 0.865, in other words, there is over an 80% chance of detecting an effect if one genuinely exists (Field, 2005). Therefore, it is reasonable to suggest that the sample size meets standard requirements.

4 ANALYSIS AND FINDINGS

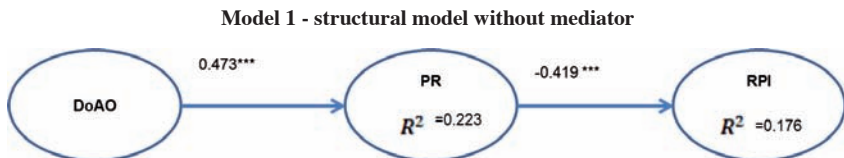
To analyse the survey data and to test the hypothesis we adopt Partial-Least Squares Structural Equation Modelling (PLS-SEM). This method is adopted for four principle reasons. First, it is appropriate to early stages of a research investigation concerned with identifying potential relationships rather than testing the magnitude of those relationships (Goodhue et al., 2012). Second, is not sensitive to small sample sizes even in medium and complex model set-ups such as this study (Reinartz et al., 2009). Third, it is suitable in model set-up containing formative measures. Finally, a Kolmogorov-Smirnov and Shapiro-Wilk test found significant deviation from normality at $p < .001$ for all indicators used in the study, as a non-parametric analysis PLS-SEM is suitable here.

'SmartPLS 2.0' (Ringle et al., 2005) was used to compute the PLS-SEM path model. To evaluate the results, we followed recent guidelines for PLS-SEM given by Chin (2010) and Hair et al. (2013), assessing the measurement models before evaluating the structural model. However, due to the restricted length of this article we focus on structural model evaluation and the testing of the

hypothesis and do not report on measurement model evaluation, although all criteria were met. In evaluating the structural model we engaged in a step-by-step analysis to provide a detailed picture of our results and to test hypotheses 1 to 3 comprehensively. Hypothesis 2 requires assessing a mediator effect. In PLS-SEM, the Preacher and Hayes (2008, 2004) approach is preferred over the Sobel test (Hair et al., 2013). Therefore, we use the PLS-SEM mediator analyses and follow the general recommendations given, for instance, by Preacher and Hayes (2008), as well as the PLS-SEM-specific suggestions given, for example, by Hair et al (2013). On this basis, evaluation of the structural model is carried out in three steps. To begin with, in step 1, we focus on the direct effect relationships between DoAO and PR (H1) and between PR and RPI (H3). Subsequently, in step 2, we introduce the mediator (H2) and evaluate the indirect effect. Finally, in step 3, we assess the full PLS path model.

4.1 Direct Effects

The results of step 1 are illustrated in Model 1. Hypothesized relationships among constructs are represented by path coefficients. Values of path coefficient vary between -1 and +1. The closer they are to 1 (positively or negatively), the stronger the relationship. When estimating the structural model without the mediator construct (Model 1), the direct effect of DoAO on PR has a significant ($p < 0.01$) value of 0.473; the effect of PR on RPI also has a significant ($p < 0.01$) negative value of -0.419. Thus, both H1 and H3 have been empirically substantiated. In substantiating H1 we also meet the first condition of mediation. Specifically, the direct effect between DoAO and PR is significant, and therefore the mediator may absorb some of the effect, hence we can continue mediation analysis (Hair et al., 2013).

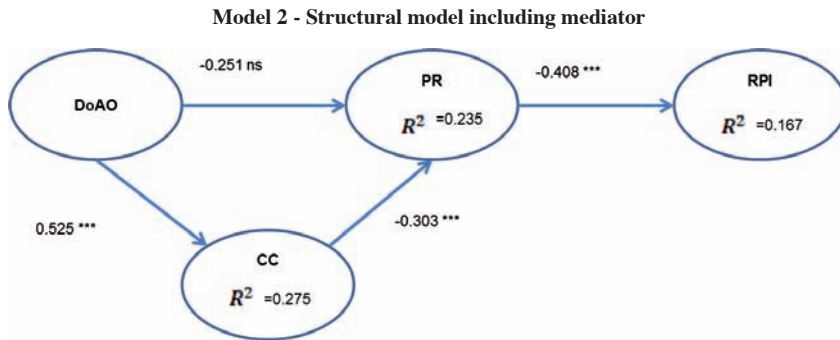


4.2 Indirect Effect

Next, in step 2, we assess the role of CC as a mediator of DoAO's direct effect on PR (H2). After including the mediator, the indirect effect must be significant. First, the significance of each path in the direct effect must be significant (i.e. between DoAO and CC and between CC and PR). After these two paths are found to be significant, we assess if their product, the indirect effect, is significant. If it is significant, the mediator absorbs some or all of the direct effect. Model 2 shows the estimates for the PLS path model including the mediator. After including the mediator construct (CC), we found that DoAO has a significant effect on CC (0.525, $p < 0.01$), which in turn has a strong and significant relationship with PR (-0.303, $p < 0.05$). As shown in Table 1, the indirect effect of DoAO via the mediator construct CC is significant (i.e., -0.159, $p < 0.05$). Moreover, showing the previously significant relationship between DoAO and PR (0.473, $p < 0.01$) becomes non-significant in the presence of co-capability (-0.251, $p \geq 0.10$). Thus, co-capability (CC) fully mediates the relationship between DoAO and PR, confirming H2. Full mediation suggests that co-capability absorbs all of the effect of DoAO on PR. In other words, a previously positive and significant relationship between DoAO and risk becomes non-significant when co-capability is considered.

Table 1 - Total Effect

	Effect Size	t value	p value (sig.)
Direct effect	0.473	6.800	0.000
Indirect effect	-0.159	2.141	0.032
Total effect	0.314		



a. Structural Model

Assessing the structural model results involves examining the model's predictive capabilities and the relationships between the constructs. The relationships between constructs have been evaluated above; we now address the structural model's predictive capabilities. This evaluation is based on the full structural model, including the indirect effect (Model 2).

The central criterion for the structural model's assessment (Henseler et al., 2012), namely the coefficient of determination R^2 , has a value of 0.167 for RPI construct; a value of 0.223 for the PR construct and a value of 0.275 for the CC construct. R^2 values of 0.2 are considered high in disciplines such as consumer behaviour (Hair et al., 2013). However, in marketing more generally these values may be considered weak (Hair et al., 2013). Essentially the R^2 value tells us that DoAO explains 27.5% of the variance in CC, together DoAO and CC explain 23.5% of variance in the risk constructs and PR explains 18% of variance in RPI. Although, not considered high, the R^2 value does substantiate the model's predictive validity (Hair et al., 2012). In sum, although the exogenous constructs have a significant effect on re-purchase intention they only explain a limited portion of the variance. The exogenous constructs which have been hypothesized to effect re-purchase intention are based on expectation of future use value as a result of the provider's resource integration in VCA's. Expectation of use value may only be one factor in determining customer judgement of intent. In forming judgments, customers may consider a variety of factors that could influence their behaviour, including the internal and external decision environment (Warshaw and Davis, 1985). As a result, we could propose that 17% of the variance in intention to re-purchase can be explained by expectation of future gains/losses as a result of provider integration in customer VCAs.

5 DISCUSSION AND CONCLUSIONS

Based on discussion in literature we hypothesise in this paper that the degree of VCA outsourced by the customer to the provider affects their perceived risk of repurchasing (H1), which in turn, influences their intention to re-purchase (H3). The reasoning being, that the more activity they outsource to the provider, the more interaction and interdependency there is likely to be between customer and provider in delivering the offering (Windahl and Lakemond, 2010). As a result,

customers lose an element of control, leading to uncertainty and risk in the exchange (Brown et al., 2011). Hence, literature suggests that future customer-provider collaboration in use increases perceived risk at purchase for the customer. However, literature also alludes to a third explanatory variable – the exchange relationship. In this respect, literature indicates a prior relationship between the customer and provider reduces uncertainty (Johnston and Lewin, 1996). Furthermore, positive experiences of interaction in the past lead customers to assume that future experiences with the supplier will also be positive, having a positive influence on their purchase probability (Brown et al., 2011). As such, we hypothesise that the customers perception of their co-capability with the provider, mediates the relationship between the degree of VCA outsourced and their perceived risk of repurchase (H2). In statistically supporting all of the hypotheses, this paper finds customer perception of co-capability in use fully mediates the relationship between the degree of VCA outsourced to the provider and customer perceived risk and therefore becomes a factor in their future purchase intention for PSS.

5.1 Implications for Theory

This paper contributes to literature, first, by addressing calls in the literature to identify a connection between the resource integration stage (i.e. use) and the value proposition stage (i.e. purchase) of exchange (see Ballantyne et al., 2011, Kowalkowski, 2011, Moller, 2006). Second, we address gaps on a customer perspective of servitization. While from a provider's perspective, servitization brings about a change in business model (Ng and Briscoe, 2012, Kindstrom, 2010); a change that presents challenges in defining and communicating the value proposition, collaboratively enacting that value proposition in partnership with the customer and other actors in the network and successfully capturing value from the exchange. For the customer, servitization represents a change in the offering and the value proposed by the provider. Resulting in a decision on whether to retain VCAs in-house or whether, to varying potential degrees, engage the provider in the activity. Arguably, this side of the buyer–seller exchange dyad is much less well understood. Indeed, in a review of literature, Baines et al. (2009: pp.552-553) do not find any papers that treat service marketing or customer value of servitization as a key theme. We contribute to this gap by taking a customer perspective of the value proposition and by identifying co-capability as a factor in purchase intention.

5.2 Implications for Practice

Literature suggests that many organisations experience difficulty in selling and communicating the value of PSS to customers, particularly outside of close buyer-seller relationships. The research in this thesis is explanatory, describing and explaining relationships that effect the evaluation of PSS by the customer. It does not explain how the provider should interact with the customer in the act of proposing the offering, or indeed what the content of the proposition should be, as a result of this relationship. However, we can at least make tentative statements on how our observations may guide managerial decisions.

Literature suggests that a better understanding of the customer perspective is crucial in enabling organisations to better design PSS that propose value to their customers, and to better collaborate with the customer in the enactment of the proposition (e.g. Töllner et al., 2011). Our research indicates that firms need understand the VCAs which support value in use of the equipment, but also the nature of how their resources are integrated into those VCAs and the effect they may have on the customer's processes and outcomes. This is because perceived complementarities of resources, and ability to integrate them, will affect customer evaluation of the offering. Further, given the potential for increased uncertainty and risk in purchasing PSS compared to buying products alone, careful and considered communication of the offering, clear co-capability (i.e. operational linkages, cooperative norms, mutual adaptations and information exchange), and appropriate revenue models that capture value for the provider but also incentivise co-capability are required. Therefore, whether through positive experience, communicated evidence or through risk sharing agreements, provider's need to communicate and evidence the quality of outcomes customers can expect from a given kind of interaction. Finally, factors of co-capability explored here (i.e. operational linkages, cooperative norms, mutual adaptations, information exchange) should be considered relational governance

mechanisms, this research shows they play an important role in customer decision making and therefore firms should not concentrate on contractual forms of governance alone.

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COMPETITIVE BIDDING FOR OUTCOME BASED CONTRACTS – PRICE TO WIN?

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ABSTRACT

The suppliers of long-life assets such as submarines and airplanes no longer simply sell these assets but provide advanced engineering services. In other words companies that traditionally designed and manufactured long-life products now compete through the provision of a service, such as asset availability.

These companies face a high level of uncertainty due to the novelty of the process and the long-term nature of services. However, regardless of these uncertainties the service provider needs to estimate the cost and expected profits for such provision. The pricing decision of these service contracts is influenced by multiple factors and considerations and as a minimum the supplying contractor needs to yield suitable profit to sustain their business. From current research it is known that the estimated company profit is often optimistic. This places pressure on both the customer and the service provider. From our research we found examples of reductions in profits for those providing services. For example a company, which moved to performance-based road maintenance contracts, only yielded less than 50% of their expected profit. So, how can providers of long-life, high-value assets estimate the costs for delivering an expected outcome and account for the uncertainties? One of the challenges is measuring such uncertainties and taking account of them in the pricing decision.

In this paper we present our research to date on the provision of a framework and a five-step process for modelling the influencing uncertainties and the impact of these uncertainties on the price bid. We will present the background need for such analysis and then provide an overview of our approach and findings to date. Finally, using an exemplar service we will demonstrate how using our approach highlights the probability of winning the contract, the probability of making a profit and the expected profit value for particular price bids.

Keywords: Outcome based contracts, uncertainty modelling, price to win.

1 INTRODUCTION

Many Manufacturing industries have moved from selling products to providing product service systems (PSS), where the product/asset is offered with support arrangements such as maintenance or a guaranteed availability. These types of contracts are not new. For example, in Sub Saharan Africa

and Latin America, Performance-based Management and Maintenance of Roads (PBMMR) have been adopted since the late 1980's, the first being in British Columbia Canada. The focus of the PBMMR was aimed at reducing the costs of the roads and increasing the quality of the roads (Zietlow, 2011). Although roads are not complex assets, the PBMMR moved from providing cost plus (i.e. the cost of the activity plus an agreed profit) for roads to the providers being paid for the 'quality' of the road 'in-use'.

The same principles apply in complex high-value-manufacturing (HVM) assets such as trains and planes. Examples of such high-value assets include the recently announce Bombardier £1.3 billion GBP deal with Transport for London to provide new trains, depot and maintenance for the London CrossRail project (Bombardier, 2014). Other examples include businesses contracting for availability or being paid to provide capability and performance such as the Rolls Royce £865M contract with the UK Ministry of Defence (MoD), (Rolls Royce, 2010) and BAE Systems £446M Typhoon contract (2012). Within the UK defence sector the, the MoD spent £19.9 billion with UK Industry in 2013 on both products and services (MoD Contracts, 2014), with the annual spend on support being £7.5 billion (Jones et al, 2014).

As described by Zietlow (2011) and Selviaridis & Norrman (2014) PBCs result in the contractor holding a much higher risk than previous cost plus contracts. Under these conditions companies 'bidding' under competition for these support contracts need to estimate their cost as well as ascertain an appropriate price bid. As part of this process, the bidding company needs to understand the uncertainties and risks involved with the contract as well as determine an appropriate price bid to win the contract over any competitors.

In this paper we provide a summary of our framework for 'Managing Uncertainty in Contract Bidding' (Newnes and Goh, 2013). The aim of our approach is to assist industry in their pricing decisions for high-value contracts under competition. Our step-by-step approach is used to model the uncertainties to demonstrate the impact these may have on the price bid. To date the framework has been evaluated through a number of industrial workshops. The underpinning academic analysis can be found in Kreye et al (2014).

In the remainder of this paper section 2 presents our proposed framework and the five-step process used to identify and model the uncertainties in the bidding stage. We provide an exemplar study to demonstrate the application of our approach in section 3. The exemplar has its groundings in a real scenario demonstrating that the customer had an unrealistic expectation of price for the service they were contracting for. In section 4 we conclude the paper and provide an insight into our future research activities, in particular modelling the intangible attributes such as trust, within our framework.

2 FRAMEWORK AND FIVE-STEP PROCESS

Figure 1, depicts the four factors identified, which can have an influence on a companies bidding strategy. The Internal company processes include for example the design of the service provision and the cost estimate for delivering the proposed service. The service contract conditions include attributes such as any offset arrangements required as part of the contract as well as the core requirements for the service. The final two influencing factors include the customer. Uncertainties, which may arise here, include for example affordability of the service to the customer, their declared/estimated budget limitations as well as the influence of stakeholders. In defence the MoD may be awarding the contract but other stakeholders include the actual end-users of the service such as the Royal Air Force. The final influence is that of competitors and how the bidding company is placed in comparison to them, for example in terms of the service provision and price. To apply the framework in a bidding situation a five-step process is used. First the relevant uncertainties for the particular bidding situation are identified. Information on each of the identified uncertainties is collected, processed and the uncertainties are then modelled. Finally a decision matrix is created to assist the decision-maker in determining the price to bid.



Figure 1 Contract Bidding Framework

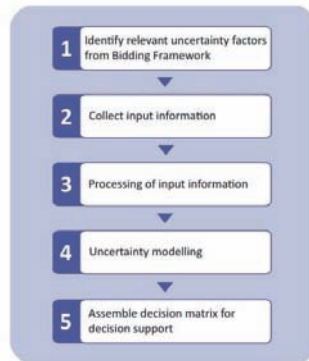


Figure 2 Five-Step Process

3 USING THE FIVE-STEP PROCESS – AN AVAILABILITY EXEMPLAR

To demonstrate the application of our framework consider a company called P2W. P2W is bidding for a 15-year aircraft availability contract. P2W and their three competitors all have experience of aircraft availability contracts, however, this contract is for a new aircraft, which has not been in-service before. Our approach is utilized by industry by following the five-step process shown in Figure 2. The following sections describe the generic process using a sub-set of the data – the expected price bid of the three competitors. However, to undertake the uncertainty modelling and provide the final decision matrix other data will be required.

3.1 Step 1 – Identify relevant uncertainties

In this scenario, the P2W bid team identified one uncertainty – the price competitors would likely bid. The bid team had limited knowledge on what the competitors would likely bid. However, the bid team identified a member of staff within P2W who had a good knowledge of the three competitors who were expected to bid against P2W. Where previous data is not available and/or data is limited expert judgment is used to gather data for analysis as described in step 2.

3.2 Step 2 – Collect Input Information

The expert was asked to estimate what they believed the competitors would bid. They were asked for four values the expected minimum and maximum price bid for each competitor as well as the absolute minimum and maximum price bids. As part of the process the expert was also asked to identify the confidence they had in their estimates as either a numerical or verbal response. To assist the expert and the modelling process, the confidence levels were provided to the expert in both pictorial and numerical form as shown in Figure 3. Figure 4, shows an example of the type of information an expert may provide. In this case the expert provided an interval response based on the questions asked by the bid team.

Figure 3 Confidence Levels



Figure 4 Expert opinion Expected Price Bid Competitor A



3.3 Step 3 Process Input Information

Once all the expert judgments and data are collected the information needs to be processed. Each of the experts gave an interval response as well as their associated confidence levels for their estimates. To process the information the diagrammatic and mathematical representations are processed for each expert. For the example shown in Figure 4, equation 1 is used to determine the Probability Density Function and equation 2 is used to determine the cumulative density function.

$$\left\{ \begin{array}{ll} 0 & \text{for } x < 8 \\ \left[\frac{0.025}{(9-8)} = 0.025, \frac{0.125}{(9-8)} = 0.125 \right] & \text{for } 8 \leq x < 9 \\ \left[\frac{0.75}{(11-9)} = 0.375, \frac{0.95}{(11-9)} = 0.475 \right] & \text{for } 9 \leq x \leq 11 \\ \left[\frac{0.025}{(12-11)} = 0.025, \frac{0.125}{(12-11)} = 0.125 \right] & \text{for } 11 \leq x \leq 12 \\ 0 & \text{for } x > 12 \end{array} \right.$$

Equation 1- used to calculate the PDF

$$\left\{ \begin{array}{ll} 0 & \text{for } x < 8 \\ [0.025(x-8), 0.125(x-8)] & \text{for } 8 \leq x < 9 \\ [\min\{0.375(x-9) + 0.125, 0.475(x-9) + 0.025\}, \max\{0.375(x-9) + 0.125, 0.475(x-9) + 0.025\}] & \text{for } 9 \leq x \leq 11 \\ [\min\{0.025(x-11) + 0.975, 0.125(x-11) + 0.875\}, \max\{0.025(x-11) + 0.975, 0.125(x-11) + 0.875\}] & \text{for } 11 \leq x \leq 12 \\ 1 & \text{for } x > 12 \end{array} \right.$$

Equation 2 – used to calculate CDF

For each of the three competitors the collected data is processed and the values for the PDF and CDFs calculated. The expected price bid for competitors A and C are based on interval analysis, where the price bid for Competitor B uses a triangular distribution.

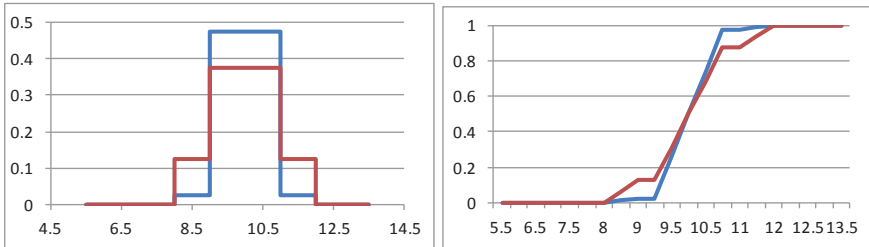


Figure 5 – Pictorial PDF & CDF for the Estimated price bid for competitor A

3.5 Step 4 – Uncertainty Modelling

Once all the data is collected and processed the uncertainty modelling focuses on using the input information to derive the probability of making a profit as well as the expected profit and the probability of winning the contract. To achieve this, the bidding companies expected cost to provide the service is used as well as data on the expected budget for the customer.

a) Probability of P2W making a profit and their expected profit

The cost estimate for P2W to provide the service is in the form of a three-point estimate with a minimum of 8.6, a lost likely cost of 10 and a maximum of 11.4M cost units. To bound the modelling the absolute minimum was defined as 7.5M and the absolute maximum being 12.5M cost units. The probability of making a profit can be interpreted as the probability of the cost being less than the price bid. The expected profit is the price bid minus the estimated cost. The estimated cost will depend on the company process, although often the most likely value is used, in this case 10M cost units.

If the P2W bid team decided to bid 9.25M cost units to estimate the probability of making a profit, substitute 9.25 for x in equation 3. However, this would result in an expected profit of 9.25-10, - 0.75M cost units.



Equation 3

b) Probability of P2W winning the contract

To determine the probability of winning the contract the key customer requirements are determined. If we assume in this example the customers budget limitation is the key driver, then the probability of winning the contract in this example would be a combination of the price bid being acceptable to the customer and P2W being the lead bidder.

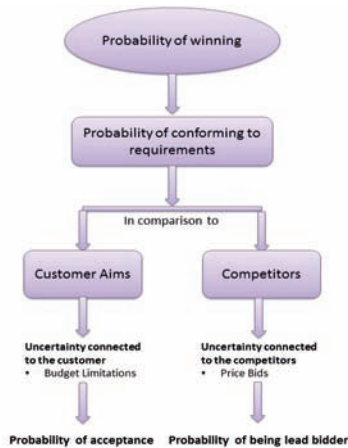


Figure 6 – Probability of Winning

The uncertainty connected to the customer is defined, as the probability of acceptance and the uncertainty connected to the competitors is the probability of being the lead bidder. These are shown in Figure 6.

The probability of acceptance by the customer is 1 minus the probability that the customers' budget is greater than the price bid. To ascertain whether P2W will be the lead bidder the probability of their bid being less than the other competitors needs to be calculated. The final stage of the uncertainty modelling is to determine the probability of winning the contract. In this example a weighting of 0.8 is allocated to the customer budget and 0.2 is allocated to being lead bidder.

3.4 Step 5 – Decision Matrix

The final step is to combine all the analysis undertaken in the form of a decision matrix. Table 1 shows the decision matrix for price bids between 7.5 and 12.5 M cost units. In this example if P2W want to have a bid price giving them more than a 65% probability of winning the contract, their probability of making a profit is 2% or less.

Table 1 – Decision Matrix

Decision Matrix															
Price bid		6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5
Probability of winning %	upper	97%	93%	88%	79%	71%	62%	51%	38%	24%	15%	8%	4%	0%	0%
	lower	97%	93%	87%	77%	67%	56%	45%	33%	21%	12%	6%	3%	0%	0%
Probability of making a profit %		0%	0%	0%	0%	2%	8%	18%	32%	50%	68%	82%	92%	98%	100%
Expected Profit	£M	-4	-3.5	-3	-2.5	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2	2.5

4 DISCUSSION AND FUTURE WORK

In this paper we have presented a framework and a five-step process used for identifying and assessing the uncertainties in contract bidding. These are currently being used in industry to provide information within the contract bidding process. How the uncertainties are identified and calculated has been demonstrated for one of the competitors in the bidding process. To undertake the whole process in detail the same steps would be applied for the bidding companies cost estimate, all the competitors and the customer budget. When more than one expert is used the probabilities are combined for the experts to obtain the probabilities to be used.

In this paper we have presented the analysis using monetary values as the core decision criteria/dominant influence. However, there are other factors such as trust in the provider of the service, societal benefits. This has become more evident with the recent vote in the European Parliament where European legislation is aimed at driving other factors than price to be used in the contract selection process. The legislation is attempting to encourage contracting authorities to select ‘Value for Money’ where the value may include societal, impact on the supply chain, support for apprenticeships and money being spent in the UK.

The next phase of our research is to extend the modelling approaches presented in this paper to ascertain the influence of non-monetary factors in the contract winning evaluation. Dr Goh and Newnes will complete the activity by August 2014 and will be running industry workshops in the Autumn of 2014.

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THE CUSTOMER-SUPPLIER CONTRACT AS A BOUNDARY-OBJECT WITHIN THE SERVICITIZATION PROCESS

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ABSTRACT

In this paper we focus on how a manufacturer can modify his organization in order to be able to offer services in the specific context of SMEs. We suggest considering the customer-supplier contract as a boundary object (Star & Griesemer, 1989) which really becomes a significant artifact within the servitization process. In particular, it allows the connection between different communities: suppliers, customers, management, and the employees. It serves as a mean of translation about the needs of the customer and the services which could be offered. It's also used as a mean of coordination when the pace and the terms of interventions are defined.

To understand in depth the role of the contract, we will be using a single case study (Yin, 1994) a French SME to show the difficulties faced by a company/organization when entering a servitization process. As noticed by literature, moving from a pure goods manufacturer to a PSS supplier is really challenging, and the challenges are centered on the contract settlement.

KEYWORDS: contract, boundary-object, a case study

1 INTRODUCTION

Especially settling on an agreement with customers appears as a major challenge for goods centered manufacturers (Gebauer & al., 2012; Neu & Brown, 2005; Oliva and Kallenberg, 2003). Baines and Lightfoot (2013) explain that servitization is enabled by six elements: a strong leadership, informed and engaged customers, a platform for advanced services and benefiting people with humanistic skills-sets, readiness to exploit technology, a relationship-based strategic supply partnership. Thus organizational factors are recognized as a key issue within the servitization process of goods manufacturers. Servitization modifies in depth three organizational dimensions: corporate culture, human resource management and organizational structures. (Gebauer & al., 2012; Neu & Brown, 2005; Oliva and Kallenberg, 2003).

In this paper we focus on how manufacturer can modify its organization in order to be able to offer services in the specific context of SMEs. Especially settling on an agreement with customers appears as a major challenge for goods centered manufacturers. We suggest considering the customer-supplier

contract as a boundary object (Star & Griesemer, 1989) which allows the supplier to really enter the servitization process, through the concrete definition of essential elements like the contents of the service, the customer-supplier interface, prices and responsibilities, the work organization... upon which is built their new relationship.

2 THEORETICAL BACKGROUND AND HYPOTHESIS

2.1 Servitization and the customer relationship

The literature on servitization is unanimous concerning the great importance of the customer relationship. “A key feature of servitization strategies is a strong customer centricity. Customers are not just provided with products but broader more tailored ‘solutions’” (Baines & al. 2009). But developing a strong customer centricity can be a major challenge for manufacturing firms. Specially, the customer interaction has to move from transaction-based (selling products) to relationship-based (establishing and maintaining a relationship with the customer) (Oliva and Kallenberg, 2003). Indeed, in order to understand the customer’s problems and needs for new services, the provider has to be involved in an intimate business relationship with the customer. The provision of services implies a closer customer relationship, and the movement from a transactional business orientation based on the making and selling of goods, to a more customer centric approach, providing a combination of product and service.

But this can be challenging for manufacturing firms which do not have this customer orientation and service culture. For Kowalkowski & Kindström (2013, p. 5), “Selling services generally require new competences, customer touch points, resources and processes” and “Stronger customer relationships are a key driver for servitization. Furthermore, solutions and other PSS in particular require new customer touch point and mutual adaptation in order sell and deliver the offerings” (2013, p. 6).

As noticed by Nudurupati Sai and al. (2013), we can wonder “How to develop capability to understand the contextual variety of customer needs and what are the various methods, tools & techniques?”. In this paper, we argue the contract is one of the tools that firms have to use to help them defining and agreeing with the customer the content and limits of the offered solution.

2.2 The contract, a boundary object between the client and the supplier

The contract is considered in this research as a dialogue, a global message, a situated language, based on a context. In our approach, the objects (and therefore the contract) are artifacts participating entirely in the relationship between social actors such as the customer and the supplier. According to interactionist sociology, the interactions are done with and around the objects that become the instruments of the interaction. Van Dijk (2006) in social psychology defines mental models as the representations and beliefs that support interactions and link the micro-leveled interactions with the social and cultural macro-leveled ones. In particular, he insists on the importance of taking into consideration the dialogue’s contexts while finding difficulty in observing them: « Unlike discourse or interaction, contexts are usually not ‘observable’ at all, whether traditionally defined as situational or societal constraints or as defined as mental constructs. [...] Contexts only become ‘observable’ by their consequences on discourse, or vice versa, by the influence of discourse on social situations” (Van Dijk, 2006: 164).

We take the context as an important element without dominating the role of human and non-human agents. Building knowledge and perceptions are not only found in human agents, but also in the relationship tied with the artifacts. The oral language, the written language, the numbers, the icons have their own differences and they are hardware of knowledge and activities. We consider that reality can be co-designed around a document by the subjects participating in its elaboration just like a set of elements that are presented at the same time to the subject’s perception. (Boutet, 2001, Lahlou, 2000). We complete the consideration of the object as an instrument to design reality with the proposal of sociologists such as Latour (1999) and Star and Griesemer (1989) to transform boundary objects into objects capable of forming bridges in order to share senses. « Boundary objects are objects which are

both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual-site use. They may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is key in developing and maintaining coherence across intersecting social worlds.” (Star & Griesemer, 1989, p. 393). Boundary objects are those that allow subjects from different social groups to agree on certain points even if these points are going to be used for different purposes. Wenger (1998) completes this approach by considering these objects as key elements towards reaching the same goal and in building knowledge within practice communities.

In the analysis of the boundary objects, we must take into account the following elements: (Leigh Star, 2010):

- Interpretive flexibility: the meaning given to the object is not the same to all present subjects. The differences are found in the use and the interpretations of the object.
- The structure of informatic and work process needs and arrangements: the material/organizational structure and the question of scale/granularity are two elements that form boundary objects. « What is important for boundary objects is how practices structure, and language emerge, for doing things together» (Leigh Star, 2010, p. 602).
- The dynamic between ill-structured and more tailored uses of the objects: the object is on the boundary of various groups but it should not be considered as a limit but as a shared, common and flexible element which can be used by each group.

Star & Griesemer (1989) proposed four possible forms for the boundary object: a repository, an ideal type, coincident boundaries or standardized forms. We retain the type of boundary object – repository, which is a set of modular things that can be modified without changing the general structure. We propose to see the contract as a repository and to locate the indexed elements to create the proposed service in the studied case. In fact, the contract is a known and obligatory element in the customer-supplier relationship in order to promote writing certain elements. In addition, changing an element of the contract doesn't necessarily change the status of the contract.

Learning can be situated when communities share certain practices, by achieving new activities that will be slowly integrated via routine such as (Engeström (1987), Engeström & Sannino (2010), Wenger (1998). Toiviainen (2007) indicates in a research that the procedure of learning is realized by learning on different levels of structures: the network-ideological level, the project level, the production level, and the worker level and insists that the « co-configuration is needed when new tools are introduced » (Toiviainen, Keruoso & Syrjälä, 2009, p. 521).

We will therefore look to find in the service contract analysis, the four dimensions defined by Wenger (1998):

- Abstraction : the boundary object has a general character that eases dialogue between people;
- Accommodation : various activities are possible due to the boundary object;
- Modularity : different parts of the object can serve as a basis for the activities of different actors;
- Standardization of the information contained in the object makes this information interpretable and usable locally.

We will point the role of the contract in the elaboration of a new service oriented relationship with a new client. For this purpose, we propose to analyze the co-design of a service contract between a company and a new client.

3 CASE STUDY

Identifying the role of the contract in servitization requires full understanding of the contract being modelled. We chose a case study approach because it represents the best way to observe and evaluate non tangible and complex phenomena such as the evolution of corporate culture (David, 2005). “A case study is an empirical survey which studies a modern phenomenon in its real context, especially when the limitations between the phenomenon and its context are not very clear” (Yin, 1994) .

The approach enabled observations of an evolving context through meetings with managers and longitudinal observations, to capture phenomena that need to be addressed to provide understanding of the relation between the provider and the customer.

The collected data is within the framework of a research project funded by the French National Research Agency (ANR). This project (ServInnov) studies servitization via close collaboration with several SMEs in the French Rhône-Alpes Region, and an action-research device was built with these SMEs to analyze their development and shift towards servitization. This device included regular meetings with and interviews of managers and people involved in the servitization process and a follow up for a period of two years. The case study was prepared by accumulating primary and secondary data. The primary data included interviews with the directors, managers and clients, the secondary data included reports from research meetings, service contracts, and exchange of emails on potential services for clients...

The observations on the contract are based on the analysis of 6 versions of the contract; starting from the first draft to the last proposal, which was validated and signed by the customer.

The company studied is ENVIE Loire, of the national network ENVIE. This network includes 45 integration companies for unemployed people or for those who have been pushed away from the labor market. ENVIE enables them to acquire knowledge in the renovation of guaranteed home appliances. In 2000, ENVIE Loire expanded its activity via its branch ENVIE 2E. This branch collects and recycles home appliances instead of discarding them. Most of ENVIE's actual revenues is generated from direct home appliances sales, whilst public grants form the remaining share of revenues, making the company's financial situation very precarious; it suffers from a constant rise in wage costs which disrupts its activity.

In 2012, a strategic reflection on servitization was launched by ENVIE via its general manager. The goal is to enter new markets and diversify the company's activities. However, for this SME to enter the servitization process, profound changes have to be done, especially in its customer relations. This company has to learn how to work with professional clients since they use to sell to private clients.

The contract was co-designed by a group of researchers from Ecole des Mines, the CEO of the company and the manager of the client structure which we will call ME. The proposal to accompany the company during its experiment was taken in April 2013. The choice of the targeted company as a client company for the experiment was based on mutual knowledge of the manager of ME with the researchers, and the manager's will to work with companies like ENVIE and obviously because this client has an interesting laundry room: at the moment, there are 5 washing machines and 4 dryers. This structure was otherwise contacted in 2012 under a market study for potential service offers for ENVIE. Afterwards, many contacts occurred with the manager of the ME as followed:

- May 2013 : Appointment at ME with its manager, the CEO of ENVIE, an administrator and a researcher
- July 2013: request of additional technical information by email
- October 2013: Appointment at ME with its manager, ENVIE's two technical directors and the assistant-researchers.

The first contracts circulated between the researchers and the CEO. It was the fourth version that was sent to the client ME. Then, there were two additional versions before agreeing on the final version, which was sent to the client on 28/11/2013. The contract was signed on 17/12/2013. Therefore, our analysis on the co-design of the service will be based on 6 written documents between 24/10/2014 and 28/11/2013. The service experiment started in January 2014.

4 FINDINGS: Elements of the service defined by the contract

The boundary object is defined as a set of material and procedural work arrangements between multiple social groups. In fact, the contract isn't initially a well-structured object in both cases, before agreeing on a document that reflects the contracted elements of the service. In mid-October 2013, there was a verbal agreement to launch an experiment between the company and the new client ME. We can see it in particular if we take the number of words and the document's organization.

Table 1: Comparing the organization of the initial and final versions of the contract

	Initial version	Final version
Number of pages	3	3
Number of words	1016	1115
Number of paragraphs	66	76

The boundary object is used by different social groups when it's necessary. We can say that this is the case of the contract which wasn't designed until there was an agreement to carry out the service experiment. The contract therefore became an essential element that was designed multiple times in order to define the offer.

The boundary object reflects the social groups that it represents. In the case of the contract with ME, we see that this was the case through topics which were detailed by one or the other. Thus from Envie's side, the first three versions (not sent to the client) allowed to work on:

- The price of the offer, therefore modifying it based on the costs included in the offer
- The duration of the experiment, which was estimated for a year but then changed at the last moment to 3 months, when the proposal was being sent to the client ME. We interpreted this as the will of Envie's manager to withdraw from the contract in case of any problems, without being committed for a year.
- The response time of 24H in the first two versions of the contract was changed and presented to the client to 48 hours in the third version.

The elements that didn't change in the different versions, including those of the client's:

- The object of the contract: « preventive maintenance and priority breakdown service as described in article 4 of the items described below « the items-object of the contract ».
- The number of maintenance visits and their planning,
- The client's obligations.

Certain contract elements changed after round trips because of differences in the actual situations: between the definition of an ideal service package and the actual organization of both companies: that of the supplier and that of the client ME. Therefore, we find the following elements, which allow the concrete implementation of the maintenance service, to have evolved:

- Response time; initially defined for 48h, Envie's manager chose this time in order to have more flexibility to schedule the intervention and take into account his workshop's existing obligations. However, the client demanded him to change it to 24h, and the final agreement was for "48h at the latest".
- Schedule of interventions : initially defined by the supplier based on time slots from 8h -16h ; the client then modified it to take into consideration his opening hours and made it from 8h-12h and 13h-17h. The supplier finally proposed 9h-12h and 13h-17h.
- The price was validated by the client after receiving details on its components.
- Payment terms: in the following table, we identified the payment terms. We notice that the proposed billing is brought back to a monthly scale, rather than being based on the duration of the contract. It is the supplier's way to minimize his risks and insure steady cash input that cover treasury problems. The client demanded his validation on additional bills before payment; which was accepted by the supplier who can benefit from highlighting what the additional billing can cover.

Table 2: Evolution of the payment terms in the contract versions

Initial contract	Contract proposed to the client	Modifications requested by the client	Final contract
The price of the current contract is charged in advance each year and due when the contract is effective or on its anniversary date. Additional charges are billed when identified. All bills are payable within 30 days of their reception in cash, net and without discounts.	The price of the current contract is charged in advance each month and due when the contract is effective or on its anniversary date. Additional charges are billed when identified. All bills are payable within 30 days of their reception in cash, net and without discounts	The price of the current contract is charged in advance each month and due when the contract is effective or on its anniversary date. Additional charges are billed when identified and accepted by the client based on a quotation . All bills are payable within 30 days of their reception in cash, net and without discounts	The price of the current contract is charged based on a monthly bill given the occurring events during each month. Additional charges of the maintenance contract are charged when identified and accepted by the client based on a quotation . All bills are payable within 30 days of their reception in cash, net and without discounts

Finally, we set aside a category of the contract which was presented globally by Envie and later defined by the client: the supplier's obligations. However, we will return to this topic in the next section because we consider it as a learning element of the idea of services for Envie.

In the end, a contract containing elements proposed by both parties was co-designed based on the design of 6 different documents.

Envie's learning can be highlighted through the evolution of the contract. The changed elements of the service have all been thought off, discussed and detailed. Thus, the supplier's obligations were initially defined synthetically and certain points were proposed by the client and validated by Envie without any problems. The exchanges with the client allowed, in the contract to define more precisely the organization and realization of the service regarding the following issues:

- Filling out an intervention book,
- The designation of a named contact to maintain the client relationship,
- The identification of potential damage by the supplier,
- The obligation to inform the client within 48h of the machines' downtime.

The terms of transferring information related to the proposed service were chosen by the client; this allowed the supplier to create a follow up document of the client's services, identify which member of his organization is going to be in charge of these services and limit the reactivity of non-predictable services' organization.

Table 3: Details on the supplier's obligations in the contract's versions

Initial version	Final version = version validated by the client
<p>The supplier will be clear of any responsibility in case of non-observance by the client of one of the contract's clauses, or in case of the occurrence of one of the events included in the chapter entitled "Exclusions".</p> <p>The supplier can't be in any case held responsible for the direct or indirect damages resulting from the use of the system, including the case of data or information loss.</p> <p>The supplier can't be held responsible for the system's breakdowns or malfunctions, regardless of the duration of the breakdown or downtime before restoring the proper system function.</p> <p>The supplier isn't, in any case responsible in the occurrence of natural events, or any other events beyond his control such as strikes, work interruptions, supplier delays, accidents or disasters.</p>	<p>The supplier will fill on the spot an intervention book which will contain all his interventions, the performed operations, the required time, the name and signature of the employee. This book must be filled during each type of intervention: maintenance or breakdowns. This book will be handed to the secretariat of the ME.</p> <p>The supplier is obliged to provide a named contact to the client (by phone or email) in order to inform him, in the shortest time of a malfunction or halt of one of the machines.</p> <p>The supplier will be clear of any responsibility in case of non-observance by the client of one of the contract's clauses, or in case of the occurrence of one of the events included in the chapter entitled "Exclusions".</p> <p>The supplier can't be in any case held responsible for the direct or indirect damages resulting from the use of the system, including the case of data or information loss, unless these damages are directly related to the interventions of the supplier.</p>

	<p>The supplier is obliged to inform the client on the same day of his intervention (or within the 48h) of the predicted duration of the breakdown or the downtime of the machines.</p> <p>The supplier isn't, in any case responsible in the occurrence of natural events, or any other events beyond his control such as strikes, work interruptions, supplier delays, accidents or disasters.</p>
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5 DISCUSSION AND CONCLUSION

Based on the elements seen above, we propose the following learning steps as to what the service can be for this first client:



Figure 1: steps of co-designing the service through the contract

Regarding the future of this first contract, we consider that it helped design the service and therefore can be the standard basis for future service contracts. From a boundary object – a repository, which allowed to create the contract's sections and their elements, it seems that the contract evolves towards a boundary object – standard that will be used for future service proposals for other clients of similar nature. But in order to verify this, future contracts must be observed.

The process of servitization took a year to start and it began with an impregnation period on the idea of services on a strategic level. It was the director's integration period in this research project and it allowed him to participate in two seminars on servitization and to be accompanied for a PSS orientation. A study conducted on the possible services for this company offered the director real elements to build upon. When the decision was taken to do the experimentation in July 2013, the production managers also became involved in the project. At the beginning of 2014, the company initiated the experiment with the client. Time promotes a change towards services because it allowed the director and the board members to familiarize with PSS by interacting with the researchers and the new customer. This infusion period for service culture is necessary for the manager. And we notice how a contract allows members of the organization to integrate this service.

Wenger indicates that brokers facilitate transactions and allow learning by introducing elements of a certain practice in another. He also suggests that these brokers contribute in the creation of new meanings via this operation of transfer (Chanal, 2010). We can suggest that researchers play that kind of role.

The contract thus becomes a significant artifact within the servitization process. In particular, it allows the connection between different communities: suppliers, customers, management, and employees. We don't ignore the importance of having a set of standard tools and methods to design and develop PSS successfully but perhaps the solution is to have a frame which can be transformed as the situation needs it. It not only shows the supplier the customer's exact needs, but also the services that could be offered to the customer. The discussion about the services and how they could be written in a contract represents the core of this contract, and when discussing them, the future link between the customer and the supplier can be clarified. It also represents an instrument of coordination when the pace and the terms of interventions are defined.

The role of the contract was understood in depth by the use of a single case study (Yin, 1994), a French SME. This case study revealed the difficulties that a company/organization faces when entering a servitization process. As noticed by literature, the shift from a pure good manufacturer to a PSS supplier is really stimulating, and the challenges are concentrated on the contract settlement. We can say that the case study is still a work-in-progress because servitization is in the testing stage with one customer. Now, we are waiting for the next contracts.

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MAKING ENERGY SERVICE COMPANIES (ESCOs) FUTURE FIT

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ABSTRACT

Energy service companies (ESCOs) are faced with a range of challenges and opportunities associated with the rapidly changing and flexible requirements of energy customers (end users) and rapid improvements in technologies associated with energy and ICT. These opportunities for innovation include better prediction of energy demand, transparency of data to the end user, flexible and time dependent energy pricing and a range of novel finance models. The liberalisation of energy markets across the world has leads to a very small price differential between suppliers on the unit cost of energy. Energy companies are therefore looking to add additional layers of value using service models borrowed from the manufacturing industry. This opens a range of new product and service offerings to energy markets and consumers and has implications for the overall efficiency, utility and price of energy provision.

1 INTRODUCTION

This paper describes four different examples of energy service companies currently operating in the UK and discusses the changes that the energy sector will face and opportunities for new service offerings for the future. Energy service companies (ESCOs) are defined as: A company that provides energy efficiency related and other value-added services and for which performance contracting is a core part of its energy-efficiency services business (Larsen, Goldman, and Satchwell 2012; Vine 2005). ESCOs are gaining popularity as energy end users find that they must invest heavily to meet ambitious sector or organisation specific carbon emission reduction targets and against consistently increasing and volatile energy prices. The types of ESCO and the services they offer are also becoming more complex and nuanced as the options for energy efficiency and onsite generation become cheaper against conventional energy provision.

The following sections describe the different business models available to ESCOs and then sets out some of the challenges and opportunities facing the energy sector in general over the coming decades.

2 ESCO BUSINESS MODELS

There are several business models commonly used to construct ESCOs, each suits different types of service provision and different types of end user. Different companies tend to focus on different service offerings given their history and capabilities. Larsen et al. (2012) split ESCO offerings into the categories of Guaranteed Savings and Shared Savings models. This definition is drawn from

experience in the USA ESCO market and is found to be appropriate for ESCOs observed in the UK. However the literature regarding USA ESCOs tends to focus on projects that save energy through investments in more efficient equipment rather than companies that are providing a commoditised energy service or product such as heat, power or cooling. The distinction between guaranteed savings and shared savings remains useful for investigating trends and opportunities in the UK market.

Under the shared savings model the ESCO operates as a service provider between the customer and a financier. The ESCO holds responsibility for maintaining and operating the energy services equipment and holds a contract with the financier based on the asset value of the equipment and a separate contract with the customer that defines how savings associated with the energy services equipment will be shared between ESCO and customer. The ESCO will use its portion of the savings to repay the investment made by the financier as per the terms of the investment agreement. Under the guaranteed savings model the customer has two separate contracts, one with the financier which is a loan based on the estimated savings available from installing the energy service equipment, and another with the ESCO in which the ESCO guarantees that the equipment will make a cost saving sufficient to cover the loan repayments plus a fee to the ESCO. If the equipment underperforms the ESCO compensates the customer sufficiently to cover the loan repayments. In the guaranteed savings model the financier accepts the credit risk of the project and the ESCO commits that it has the techno-economic assessment accurate enough that it will have its fee covered (Okay and Akman 2010). In the shared savings model the ESCO makes its money through constantly ensuring the energy service equipment is operating optimally. The associated contracts will also specify the equipment owner at the end of any contract.

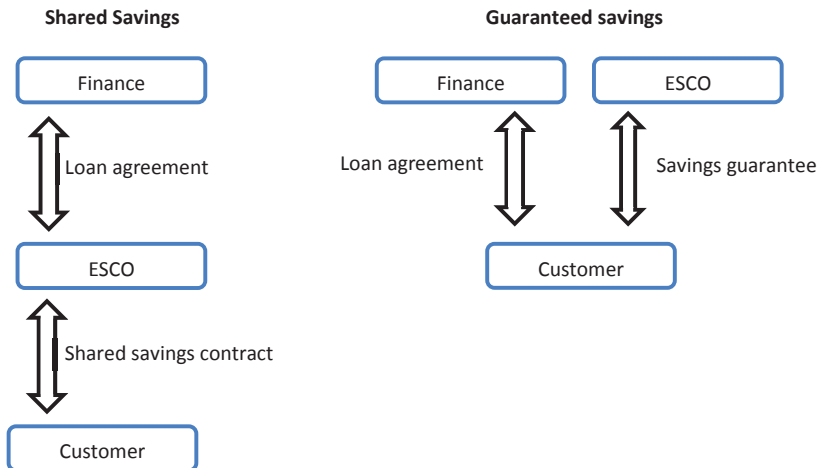


Figure 1: ESCO business models adapted from Larsen et al. (2012)

The advantages to the customer of engaging with an ESCO under either of these models are usually associated with savings on utility bills although some clients also engage with ESCOs because they have carbon savings targets to meet. ESCO's can enable customers to embark on projects that would have otherwise been too capital intensive and not have sufficient return on investment for the customer to accept. The ESCO also allows for several energy related projects to be bundled together allowing less attractive projects to be balanced against those with better returns on investment, the final

combination of projects meeting the requirements of the customer and the ESCO contract. ESCO contracts are nearly always long-term (10-25 years). This is because the return on investment on energy efficiency technologies is often marginal under shorter term investment criteria.

Services regarding energy provision and energy efficiency are not always limited to the above models which involve commercial agreements being used to leverage finance where otherwise difficult. In addition to this set up there is a growing trend for energy suppliers to offer services in addition to offering units of energy. The UK market has led this type of service offering with its liberalised supply market and legislative requirements placed on suppliers. Services being offered in addition to the sale of kWh include energy efficiency measures such as loft or cavity wall insulation (where the supplier acts as a guaranteed savings ESCO) and services around smart-meter data which is increasingly available to smaller energy users. These offerings are immature in the market and remain largely legislation driven although suppliers do use them to compete and their deployment is impacting on end user experience and system efficiency (Balta-Ozkan et al. 2013; Clastres 2011; Gans, Alberini, and Longo 2013).

3 UK ESCO EXAMPLES

This section outlines several instances of ESCO's and describes their development, the business offering and the advantages for each party.

Cofely energy services is the UK's largest district heating provider. Cofely are a subsidiary of GDF Suez who provide the financial liquidity to underwrite large ESCO special purpose ventures and associated investments. Cofely describe their model as 'avoided costs', the case for the customer is a fix and usually a reduction in heating and electricity costs over a long term contract (20+ years). Cofely generally achieve this by making use of capital intensive co-generation (combined heat and power or CHP) equipment which tends to consist of a gas engine generating heat and electricity. By capturing the heat from the engine as well as the power these schemes are competitive with gas generated electricity from the national grid due to the efficiency increase. Typically Cofely guarantee savings of 5%-15% against conventional (grid electricity and natural gas) heat and power provision. The contract will include details such as sharing of profits, extensions to the network, reliability and penalties for failure to provide energy. Cofely have focused entirely on public sector, PFI and very large commercial customers recently providing district heating and cooling to the London Olympics site and expanding schemes in London, Paris, Leicester and Birmingham

E.On have been an early energy supplier to recognise that their traditional business of selling units of power purchased on the wholesale market through to consumers has limited opportunity to add value in a regulated and liberalised energy market. Whilst not abandoning their core business E.On have focused new investment on high value renewable electricity generation assets and branched into district heating schemes using CHP and biomass heating. Differently to Cofely E.On have focused on the new-build residential market and bundle the cost of installing pipework with the rest of the housing build cost (E.On 2014). E.On market their solution against savings to the housing developer for installing gas supply and boilers and on maximising space utilisation in the new buildings. This approach has faced criticism that it reduces choice for the end user as they are forced to accept energy through the district energy infrastructure which is owned by E.On and therefore cannot access the normal ofgem regulated energy consumer market, the model also relies on incentives currently available for renewable heat (DECC 2012).

Mitre is a well-established facilities management company offering a guaranteed savings service based around their expertise in energy efficiency equipment (Mitre IFM 2014)x. The company offers services for customers around both carbon and cost savings and uses the ESCO mechanism as a route to deploy its core business of managing building temperatures, energy use and installing and

maintaining building services equipment. Honeywell energy services offer a very similar guaranteed savings model (Honeywell Energy Services 2014). Mitre have used their energy services offering to extend their existing integrated facilities management offering. The customer is therefore left to focus on core activities by effectively outsourcing the management of buildings, comfort heating and power, IT service and access.

Larsen et al. (2012) reviewed the US ESCO market in 2008 and identified 38 companies operating as ESCOs but also that half of the value in that market is captured by just 4 building equipment manufacturers. The market is also dominated by public and institutional customers. No similar empirical study exists for the UK ESCO market but anecdotal evidence from energy users and the ESCO providers above indicates a growing market for ESCOs focused around reliability, price security and carbon savings. The UK market remains limited to large, heat intensive users. Energy suppliers however have recognised that the manufacture and sale of units of energy is a fairly low value activity in a highly competitive market and are attempting to add features to their offering to gain competitive advantage showing the industry is starting to follow conventional manufacturing into the service industry under the definitions found in the servitization literature (Ward and Graves 2007; Baines et al. 2009; Oliva and Kallenberg 2003).

4 FUTURE CHANGES FOR ESCOS

This section describes how various innovations and changes in the energy sector may become opportunities or challenges for ESCOs in the coming years. Because ESCO contracts are generally long term these factors will mainly affect the development of new schemes which is where much of the value in an ESCO project is exchanged.

Changing energy costs and reductions in the capital cost of renewables introduce uncertainty into the structuring of new ESCO contracts. Usually this is overcome by pegging contracts and savings against the provision of heat or power through conventional sources but this is more difficult when zero fuel renewable energy schemes are proposed as they are capital intensive and essentially require both parties of the ESCO contract to hedge against future fossil fuel prices.

Some companies and municipalities have powerful non-price drivers for engaging with ESCO models, this is especially evident in the Eastern USA seaboard and areas of Japan where utilities are being required to commit to more stringent reliability and resilience conditions following storm damage. European decision makers meanwhile have continued to focus on the reduction of carbon emissions from energy provision through improved generation and demand efficiency. ESCOs can play an important part in delivering these non-capacity objectives. The reliability and resilience issue is particularly important for certain industries which have been traditional users of ESCOs (Hospitals, prisons, emergency services and IT) but to date no ESCO has successfully managed to package (and charge) for this type of added value service.

The expected growth of decentralised generation is a clear and growing market for ESCO models to be deployed. Co-generation in particular is competitive with a high density of heat demand, this is reflected in the rapid densification of urban areas in Northern Europe and USA city centres. Increasing the proportion of properties on ESCO run decentralised generation has great potential to remove strain from national energy infrastructure and could reduce the cost of grid upgrade into the future, a major expense for all electrified areas. Again this non-capacity service has not been properly valued but some studies on the monetary value of coupled solar and battery storage have very recently been published for the US market suggesting a generalizable methodology (Bradford and Hoskins 2013).

With improvements and cost reductions in IT and communications equipment the energy sector now generates massive amounts of real time data from smart-meters on consumer sites as well as at the transmission and distribution networks. This data has opened many new opportunities for more

novel models for ESCOs based around the aggregation of demand and generation assets to better co-ordinate energy supply and demand. Examples of companies operating in this area in the UK are OpenEnergy who micro-manage demand by aggregating refrigeration capacity across large portfolios, Flextricity who aggregate backup generators across the country to generate at times of peak demand and NEST who have bundled a residential scale energy and buildings management system into a security and smoke alarm technology. All of the UK big six energy suppliers now also offer an analytical tool service to all customers previously only available to very large users.

Whilst technology and availability of information have opened opportunities for ESCOs to be more innovative in the services they offer and the routes they use to offer them, innovation is also available in the finance models being deployed. The most evident example of this has been the SubEdison solar deployment model in which the SubEdison developed a standard power purchase agreement for residential solar owners. The agreement provided a long-term reliable electricity purchase price of power generated from solar panels which was backed up by the company's own finance providers and removed many of the legislative and capital finance barriers to decentralised solar deployment. This model disrupted the market and led to market leading growth for SunEdison in the sector.

5 CONCLUSION

There are many challenges facing the energy sector over the coming years with pressures to increase reliability, decrease energy carbon content and always for the minimal cost. ESCOs have to date formed a small part of the response to these challenges, restricted from mainstream deployment by uncompetitive economics and stiff competition from conventional generation. However changes in energy generating technologies, their scale, their finance models and their sources of energy allow ESCOs to add layers of value to the transaction model and better meet the needs of customers. The changes in the market and technology should open up major opportunities for new ESCO models which demonstrate innovation in finance and technology.

Developments in understanding of the way other industries have added value to manufacturing processes through additional service offerings have a direct transfer to the energy manufacturing and supply industry. The power of ESCOs and their associated service based models could unlock an important resource of carbon savings and energy efficiency in the sector. ESCOs allow energy provision to be more customisable, bespoke and provide greater utility to customers who have requirements much more complex than covered by traditional cost differentiation capacity models. The ESCO market however is currently led by technology and innovation rather than being built on a solid understanding of customer requirements and added value the ESCO model is becoming a tool for discounting finance, by combining the industrial interest in ESCOs with knowledge from the service adoption literature a better performing sector can be developed.

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ORGANISATIONAL CAPABILITIES

ASSESSING AN ORGANIZATION'S PSS CAPABILITY

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ABSTRACT

Developing a service provisioning capability within any service-orientated organization is a prerequisite for responsive, high quality, efficient service delivery. However, simply defining a process for service provisioning is no guarantee of performance. Although a lot has been written on the methodology behind product-service design systems, little focus has been given to the concept of defining the maturity of a product-service system in terms of its capability to actually deliver.

This paper will look at the practical issues identified in assessing an organization's service provisioning maturity as it relates to its ability to identify current capability for delivering IT supported services. The base framework being used for assessing capability maturity is the IT Capability Maturity Framework (IT-CMF). This framework has been developed to help identify and assess where IT can improve business value to an organization (Curley & Baldwin, 2007). One aspect of the IT-CMF that is of particular relevance to this research is the manner in which services are designed, developed, and deployed. The critical capability that handles this for the IT-CMF is called Service Provisioning (SRP). The function of this process is to define how best to provide IT supported service offerings to customers. These services comprise a combination of people, processes and technology and are typically defined in a service level agreement. With SRP, the entire life cycle of a service is taken into account – including activities that are on-going/operational (operation, maintenance, continuous, improvement) and transitional (design, deployment and decommissioning).

KEYWORDS: Service provisioning, IT management framework, design science

1 INTRODUCTION

Considering the elements that influence the development of a PSS (Maussang *et al*, 2009; McAloone & Andreassen, 2004), this paper demonstrates how the IT-CMF's Service Provisioning (SRP) critical capability maps to a PSS methodology, but also introduces the concept of assessing the maturity of the service provisioning capability in terms of the organization's overall IT capability. The SRP critical capability identifies and defines five levels of maturity ranging from the lowest level 1 (initial) to the highest level 5 (optimising), with each level assessing against five areas of capability: service definition, service architecture, service portfolio management, customer-facing service operations, and internal service execution.

By assessing the maturity of the SRP critical capability, organizations can determine the effectiveness of their service provisioning capability, and identify what actions the organization needs to take in order to improve the maturity of their service offering.

This paper will assess the Service Provisioning (SRP) critical process in terms of its alignment to current PSS methodologies, and then use a case study to show how the SRP critical capability has

been used to identify service offering issues within an organizational setting: in this case the Central Bank in Ireland.

2 RESEARCH METHODOLOGY

The development of the IT-CMF and subsequently the SRP critical capability, has followed a Design Science paradigm (Hevner *et al.*, 2004). As such, the current iteration of the SRP is based on collaborative research between academia and industry.

The SRP capability (along with 34 other capabilities) has been developed, tested and refined through collaborative research with IVI's global network of research partners (i.e. BCG, Intel, Chevron, Ernst & Young, BP, SAP, Microsoft, and SME's including Sumerian, CSE, and Clarion Consulting. etc.,). The process by which IVI has engaged with it's research partners demonstrates IVI's ability to conduct research at a global level, across complex business environments, whilst managing the expectations of all the participants in terms of what has to be delivered, and the time lines for delivery. The diagram in Figure 1 identifies the process steps used by IVI in developing an understanding of the core-processes impacting ICT capability. This staged approach was used to ensure the IVI developed a clear understanding of how the defined capabilities manifest within the different organizations, and how these capabilities can be expected to mature. The development of these (IT-CMF) capabilities is rigorous and dependent on a continuous peer-review in order to ensure validity and relevance.

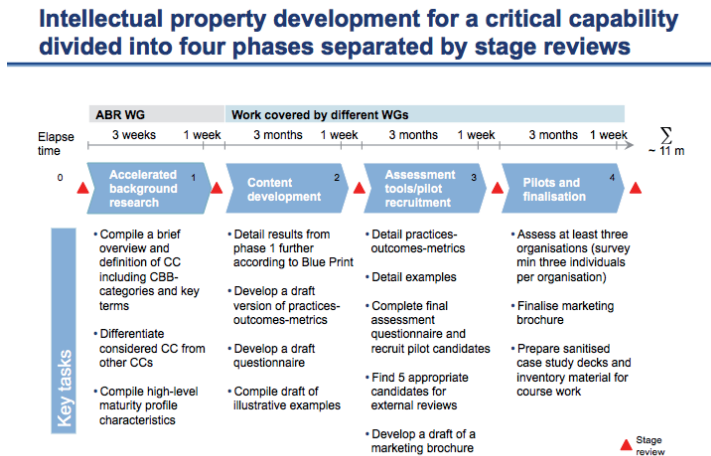


Figure 1 Research validation process

Once the capability has been developed to stage 3 the process is further tested for validity and relevance through a number of pilot assessments, and validation workshops. Although the validation process strives to ensure a balanced and objective view is maintained throughout the duration of the research engagement, the success, relevance, and objective approach is based on the dynamics of the workgroups that are formed to drive and shape the research projects.

This development cycle has been subjected to independent peer-review over a period of 3 years. This paper looks at how the SRP critical capability has been developed in-line with current PSS thinking (Mont, 2003), and then tested within a PSS business environment. The findings relate to one organization (the Central Bank of Ireland), however, the learning points have been used to refine the SRP process for further testing.

3 SRP CAPABILITY OVERVIEW

Within the context of the IT-Capability Maturity Framework (IT-CMF), Service Provisioning (SRP), is defined as: “...providing IT services to customers. Services comprise a combination of people, processes and technology and, for each customer, are typically defined in a Service Level Agreement. SRP acts as a single point of contact (from the customer perspective) for in-scope activities and is a key enabler of the IT capability. IT services are based on the use of information technology and support the customer’s business processes”.

Over a quarter of all IT staff within an organization are typically involved in SRP-related activities, but this percentage can rise to more than half of total IT staff depending on the nature of the organisation and the services they provide. As a result, service provisioning-related activities draw a significant level of resources, especially in terms of IT headcount. Identifying the most appropriate maturity levels for an organization’s service provisioning capability ensures the right resources are being applied in the right way to maximise the business value of IT. The author would assert that a detailed assessment is the most expedient and accurate way of getting the granular level of detail required to help the CIO understand how to maximise IT business value in the service provisioning domain, or any critical process for that matter.

The SRP capability is broken down into five sub-capabilities, or, to use the IT-CMF terminology, capability building blocks (CBBs). These are shown in figure 2. Against each of these CBBs the framework has defined five levels of capability maturity; against which an organization can be assessed.

Depending on this five-level variance of maturity, differing practices, outcomes and metrics are expected. These activities are investigated to ensure this maturity level is accurate. Once the “IS” maturity is established a series of recommendations can be made to support lagging capabilities and ensure the IT function moves collectively towards a higher level of returning business value.

Service Provisioning comprises two categories and five underlying capability building blocks

Category	Capability building block	Description
Transitional activities	Service definition	Description of a service offering and its components, i.e. the SLA, OLA and UPC.
	Service architecture	Engineering of service taxonomy and content, including operational processes. Service architecture deals with service components, OLAs, sourcing, costing, etc. and their inter-relationships. Definition of operational processes includes support processes (service provisioning, support by vendors, etc.) and design of interfaces to surrounding processes.
	Service portfolio management	Management of service introduction (incl. piloting) and service decommissioning.
Operational activities	Customer facing service operation	All service operation related activities with interfaces to customers. The interface to the customer is divided into three components being service desk, service request and service level reporting/management’.
	Internal service execution	All non customer-facing IT activities required for service operation. These activities are divided into service request management, incident/problem management, service level management.

Figure 2. SRP Critical Building Blocks

In terms of maturity development figure 3 shows how the five levels of maturity relate to the main categories under which the CBBs reside. In terms of adding value to the organization, maturity level 3 is generally seen as the ‘breakthrough’ level. This is where the development of the capability starts to drive significant interconnection between the business and IT.

Maturity profile levels – Summary of key characteristics

Maturity		Transitional activities ¹	Operational activities ²
High	5 Optimising	<ul style="list-style-type: none"> Services are designed to <ul style="list-style-type: none"> be tailored to customers needs respond quickly to changes in required service quality are optimized to meet negotiated SLAs comply with architectural/application portfolio standards On demand deployment/provisioning of all services 	<ul style="list-style-type: none"> Services support processes implemented and integrated across the enterprise Enterprise SM platform & service support capabilities in place Automated measurement and systematic optimisation of services Controlling of impact of improvement activities
	4 Advanced	<ul style="list-style-type: none"> IT services are defined with proactive monitoring of OLAs/SLAs Deployment/decommissioning processes take cross-functional restrictions into account 	<ul style="list-style-type: none"> Service support processes implemented across IT Service request catalogue supporting differentiated/segmented service offerings
	3 Intermediate	<ul style="list-style-type: none"> Building and testing is aligned with business targets; conceptualisation takes into account the expected cost to provision the services IT services are designed in a modular way, so that components can be re-used Deployment/decommissioning of services follows business targets Capability to roll back service deployment 	<ul style="list-style-type: none"> SM core infrastructure in place with solid knowledge of the applications IT service catalogue is populated with all IT services Incident tracking & service level management implemented Service performance reviewed regularly, based on problem reports
	2 Basic	<ul style="list-style-type: none"> Process of service transition is defined and documented Responsibilities are defined and supported by the management Deployment/decommissioning of services follows predefined and documented path/process (IT-driven) Business needs drive definition/deployment of services 	<ul style="list-style-type: none"> IT service offering and service quality are documented and measured Defined process for continuous improvement (incl. application of learning's)
	1 Initial	<ul style="list-style-type: none"> Service offerings are built/developed ad hoc Service offerings are deployed ad hoc No/ad hoc decommissioning of services 	<ul style="list-style-type: none"> Service support is kept running on an ad hoc basis No regular improvement activities
Low			

Figure 3. Maturity profiles across the SRP capability.

In practice the SRP capability needs to translate into a set of practices and measurable outcomes that gives the organization a mechanism for realising maturity improvement. Figure 4 gives a visual representation of how the practices and outcomes relate to each of the five critical building blocks.

Structure of capability building blocks provides basis for definition of practices, outcomes and metrics

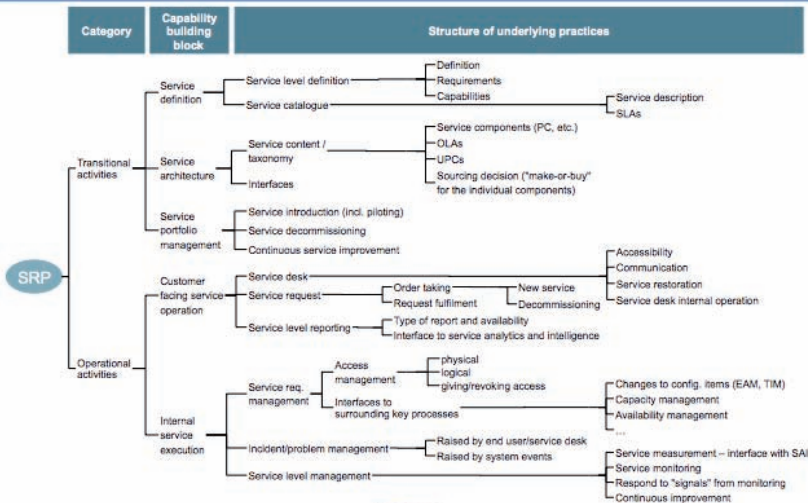


Figure 4. Practices, Outcomes and Metrics for SRP

It is against these practices that organizations can develop their improvement roadmaps for developing their capabilities.

4 A PSS METHODOLOGY PERSPECTIVE OF SRP

A key aspect of any good PSS is the ability to sense and respond to the changing operating or business environment. This ability to develop processes and systems that react in this way is a function of the capability's maturity. In essence, the higher the maturity the more responsive the capability becomes to the needs of the business. Although SRP is focused on the provision of a responsive IT service support system, the capability is defined in terms of the activities, representations, and interactions between the customer (end-user) and the service to be delivered (Maussang *et al*, 2009). The SRP capability has also been developed with a clear set of practices, outcomes and metrics that are defined at a critical building block level. This action orientation and activity focus also conforms to Gummesson's (1993) criteria for a service design methodology. However, There is another aspect of effective PSS methodologies, which is the need to consider multiple scenarios for customer or end user engagement (Morelli, 2003).

As the SRP capability is concerned with the delivery of IT services Ramaswamy (1996) provides a PSS model that looks at a design approach for service development and delivery. Morelli (2002) identifies how Ramaswamy's model divides the whole design development process for service into a design and management phase (figure 5).

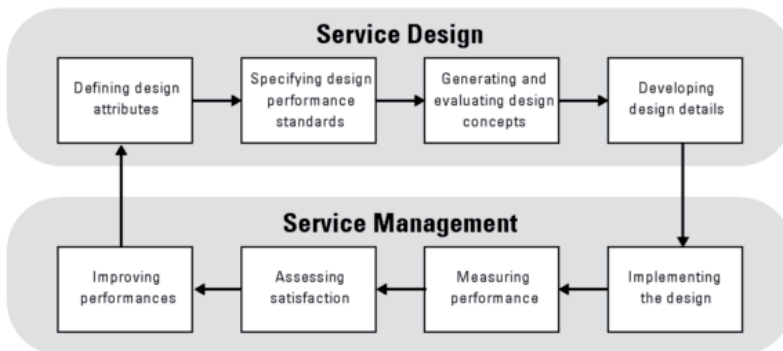


Figure 5. Service design and management model (from Morelli, 2002)

The critical building blocks from the service provisioning (SRP) capability can be mapped to service design and management model (figure 5) as shown in the table below (table 1). What is interesting is not the fact that there is a clear link between the stages outlined in the model, and the critical building blocks, but the fact that the ability to ensure alignment with the changing business environment, or the ability to support multiple scenarios, is supported through the increasing maturity of the critical building blocks (figure 2).

SRP Building Blocks	Critical	Service Design & Management Model (Morelli, 2002)	SRP Scenario Support (Maturity level 4 described)
Service Definition		<ul style="list-style-type: none"> Defining design attributes Specifying design performance Generate and evaluate design concepts 	All aspects are defined with KPIs; they are prioritized according to business relevance
Service Architecture		<ul style="list-style-type: none"> Generate and evaluate design concepts Develop design details 	Key relationships are managed in an integrated way; interfaces are defined for all surrounding processes
Service Mgmt	Portfolio	<ul style="list-style-type: none"> Implementing the design Measuring performance 	There is IT and business collaboration; there is a regular,

Customer Service Ops	Facing		collaborative feedback process
		<ul style="list-style-type: none"> Measuring performance Assessing satisfaction Improving performance 	There is an automated customer self-help interface; reporting is based on business metrics
Internal Execution	Service		
		<ul style="list-style-type: none"> Improving performance Defining design attributes 	There is tool-supported monitoring and improvement

Table 1. SRP and the Service Design & Management Model

With the SRP critical capability the transition point between the service operating as a cost to the business and starting to drive real business value is when the capability starts to perform at maturity level 3 and above. For maturity levels 3, 4, and 5 the value returned to the business increases as each level is realised. Therefore, the ability to respond to different scenarios will improve as capability maturity increases.

5 CASE STUDY

The IT function sits across the largest productivity generator in business over the past century. Today IT provides and supports almost all facets of organizational life and performance. The increasing levels of organizational complexity can make it difficult to know how and where IT can generate real business value. With large investments, poor project success rates and unforgiving maintenance costs, the CxO remain conflicted on how to raise more value from IT internally, often making strategic decisions based on anecdotal evidence or an incomplete view of the end-to-end performance of the IT resource.

One way of significantly improving the CxO's view of end-to-end IT performance is through the application of an IT-CMFTTM SRP detailed assessment. The assessment process stimulates an organic maturity level evaluation, while extracting vital information on how critical IT processes are performing by assessing planned versus actual levels of performance. This is all done within the context of improving the Business Value of the IT function. It is this maturity setting and resulting data collection process that is the bedrock for the IT management team on which they can start to build a roadmap for improvement based around Business Value.

On completion of the SRP assessment a final report contains a number of distinct sections; educational, survey process, assessment results and recommendations is presented back to the bank's senior management team. As such this self contained document enables the reader at all levels to inform themselves, observe the survey process and understand the recommendations in the context of the maturity level and information gathered.

Maturity levels with supporting comments provide particular interest. Done correctly these have been described as "acutely accurate"- reinforcing the credibility of the critical capability's maturity level (down to a capability building block level). These are also often considered supportive for other initiatives that are being promoted to senior level management.

With proper build up of the analysis, the report naturally leads the audience to appreciating the "IS" maturity levels established within the critical capability. Having established this, with a robust and sound process, group focus naturally flows on to business value recommendations.

The use of maturity metrics encourages the group to review current initiatives within the context of "Does this add business value?". This typically generates a client desire to reassess the level of maturities within a 9 to 12 month period.

6 FINDINGS

This paper presents a framework for assessing the maturity of an organization's IT supported product-services capability. The condensed and focused nature of critical capability assessments means that front-line staff find the assessment process engaging and interesting. These individuals are typically inaccessible due to the nature of their positions and demands from running daily business operations. The compact and focused nature allows them to provide effective input information into roadmap and investment plans with minimum time demands.

Secondly the assessment procedure must be adapted so that it is considered balanced and fair – The approach outlined above allows the individual privacy via the initial on-line assessment and then allows them to experience the group interaction on the matter. The individual interview provides them a final opportunity to inject their uninterrupted personal expertise again. This guarantees a complete cycle engagement.

The findings, although based on one case study, and being inductive in nature, help provide a basis for understanding the different levels of maturity a service provisioning process may go through, and what are the key interventions required to move up the maturity curve.

7 CONCLUSION

This paper provides a framework for assessing service provisioning capability, developed through collaborative research that is cognisant of the product-service system methodology. The practical application of this framework, although with one case study, gives an indication as to how to assess and quantify an organisations capability in delivering IT supported product-services. This paper will help move the discussion on from simply defining what constitutes a PSS, to how best to assess and organization's PSS capability relative to an organizations overall IT capability. As it is the author's contention that if a PSS is to develop service solutions that are responsive to changing customer / end user needs, then the maturity of the capability to develop such solutions needs to be considered.

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SERVITIZATION CAPABILITIES FOR ADVANCED SERVICES: A MULTI-ACTOR PERSPECTIVE

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ABSTRACT

Servitization is the process by which manufacturers add services to their product offerings and even replace products with services. The capabilities necessary to develop and deliver advanced services as part of servitization are often discussed in the literature from the manufacturer's perspective, e.g., having a service-focused culture or the ability to sell solutions. Recent research has acknowledged the important role of customers and, to a lesser extent, other actors (e.g., intermediaries) in bringing about successful servitization, particularly for use-oriented and results-oriented advanced services. The objective of this study is to identify the capabilities required to successfully develop advanced services as part of servitization by considering the perspective of manufacturers, intermediaries and customers. This study involved interviews with 33 managers in 28 large UK-based companies from these three groups, about servitization capabilities.

The findings suggest that there are eight broad capabilities that are important for advanced services; 1) personnel with expertise and deep technical product knowledge, 2) methodologies for improving operational processes, helping to manage risk and reduce costs, 3) the evolution from being a product- focused manufacturer to embracing a services culture, 4) developing trusting relationships with other actors in the network to support the delivery of advanced services, 5) new innovation activities focused on financing contracts (e.g., 'gain share') and technology implementation (e.g., Web-based applications), 6) customer intimacy through understanding their business challenges in order to develop suitable solutions, 7) extensive infrastructure (e.g., personnel, service centres) to deliver a local service, and 8) the ability to tailor service offerings to each customer's requirements and deliver these responsively to changing needs.

The capabilities required to develop and deliver advanced services align to a need to enhance the operational performance of supplied products throughout their lifecycles and as such require greater investment than the capabilities for base and intermediate services.

KEY WORDS: Advanced Service Actors, Interviews, Capabilities

1 INTRODUCTION

Servitization has been heralded as a means for manufacturers facing increasing commoditization of their product offer to achieve competitive advantage and create improved customer value (Baines *et al.* 2009; Vandermerwe and Rada 1988). Servitization is increasingly being recognized as a network activity, particularly for the delivery of advanced services, also referred to as use- or results-orientated product-service systems (PSSs) (Tukker 2004). This involves value adding processes being delivered by actors beyond the focal manufacturer (Kowalkowski, Kindström and Witell 2011). Thus, in order to successfully servitize, manufacturers must focus on evolving capabilities that encompass the mobilization of network actors.

Servitization capabilities are often discussed from the focal manufacturer's perspective (e.g., Ulaga and Reinartz 2011). The general presumption is that manufacturers assume responsibility for activities previously performed by customers (Mathieu 2001; Spring and Araujo 2013). A significant problem with such an approach is that manufacturer's internal capabilities are often inadequate to fully address servitization (Paiola *et al.* 2012). There is, however, limited empirical research addressing how manufacturers work with partners in order to provide services (Raddats *et al.*, 2013). Hence, this study aims to investigate the manufacturer, intermediary *and* customer perspectives on the capabilities necessary for successful servitization.

2 THEORETICAL FRAMEWORK

2.1 Advanced Services

A number of commentators have developed service typologies. Mathieu (2001) identified services supporting supplier's products (SSP) and services supporting client activities (SSC). Oliva and Kallenberg (2003) developed a hierarchy from basic product-orientated services (e.g., product installation) to advanced services (e.g., process orientated consulting). Baines (2013) delineates 'base' services (e.g., spare parts), intermediate services (e.g., maintenance, repair and overhaul [MRO]) and advanced services (e.g., availability contracting). Baines and Lightfoot (2013) define advanced services as: "*a capability delivered through product performance and often featuring; relationship over (an) extended life-cycle, extended responsibilities and regular revenue payments*" (p.22).

The delivery of advanced services in particular has a large impact on customers, enabling them to perform new business processes (Baines 2013). However, they are also more likely to require an integrated network of providers, acting together, to generate the required capabilities to create such a novel value outcome.

2.2 Capabilities For Advanced Services

Capabilities for servitization were historically derived by the OEM through its comprehensive product knowledge and intellectual property rights (IPR). OEMs possess highly developed product-related expertise which facilitate the delivery of multiple product-related offerings (Ulaga and Reinartz 2011). However, for a manufacturer to offer advanced services, new capabilities are needed, e.g., risk management (Baines 2013) and the ability to develop and price advanced services on a risk/reward basis (Baines 2013; Cova and Salle 2008). If activities previously performed by the customer are taken over, then the manufacturer also needs to develop new service methodologies or processes (Paiola *et al.* 2012). Advanced services may also require the firm to integrate products from multiple vendors (Davies, Brady and Hobday 2006). In order to achieve this, manufacturers may need to develop relational/partnering capabilities, working with partners in their network (Baines and Lightfoot 2013; Gebauer, Paiola and Saccani 2013; Storbacka 2011). Therefore, a manufacturer can pursue the 'internal' development of capabilities, or look to its wider network (Araujo, Dubois and Gadde 2003; Spring and Araujo 2013) to pursue the 'external' development (development outsourced to suppliers/partners) or take a 'mixed' approach (co-developing capabilities with customers/partners) (Paiola *et al.* 2012). For advanced services, it is more likely that a 'mixed' approach to capability development is required, since advanced services generally result in a customer being better able to perform a business process (Baines 2013).

3 METHODOLOGY

A qualitative approach was adopted for this study due to a general paucity of understanding of the nature of the problem and an associated requirement for exploratory research to develop understanding of the underlying causes of human action (Miles and Huberman, 1994). Thirty-three semi-structured interviews were conducted with senior executives across 28 organisations that have experienced a servitization process either as prime manufacturer (19), customer (11) or as an intermediary (3). In the first instance Managing Directors (MDs) of the manufacturers were contacted and they were either interviewed or provided guidance on who to interview within the organization (Directors of Sales, Operations, Strategy, Service Development or similar). At the customer organisations the MD or Operations/Supply Chain Director were interviewed. All the firms were UK based, Business-to-business (B2B) organisations purposively sampled across a range of sectors in order to build a representative sample of high-profile industrialists capable of delivering an informed opinion on the capabilities driving servitization and particularly advanced services delivered by a network of actors across multiple contexts. The manufacturers targeted were organisations with a clear manufacturing heritage and track record of technological innovation that also now offer ‘advanced services’.

Independent semi-structured interview guides were developed for the interviews, including questions addressing definitions of servitization in the context of the respondents firm, organizational change necessary to adopt servitization, and enabling/inhibiting factors for the exploitation of servitization. Of the 28 organizations a sub-set of 10 were selected in dyadic relationships with each other (manufacturer-customer) in order to explore capabilities from dual perspectives. Respondents were encouraged to talk in detail about their organizational servitization experiences in context, resulting in ‘narratives’ and ‘stories’ (Gabriel and Griffiths, 2004). The resulting transcripts were sense checked by respondents and then thematically coded by the research team. A template analysis approach was adopted (King 2004); loose *a priori* capability codes were developed from literature (Dubois and Gadde, 2002) and applied as an initial template, which was then developed and added to during the research as recommended by King (2004). Parallel data coding was carried out; with some segments of text classified within more than one code (King 2004). The template, developed from analysis of the contextual narratives of servitization experience, enabling the researchers to code emerging capability themes via detailed reading and re-reading of the text (Crabtree and Miller 1999; King 1998).

4 RESULTS

The findings suggest that there are eight broad capabilities that are important for servitization, which are discussed below:

Technical expertise

Manufacturers’ service engineers will generally have strong technical knowledge of their own products. Intra-company links between services and product engineering should provide a differentiator, enabling a manufacturer to offer more exclusive services than service provider firms or other OEMs without these links. Manufacturers and Intermediaries should also have good technical knowledge of products from other OEMs that they supply:

"We provide the engineering capability, we have a test facility, we do MRO ... but what we don't have is a product" (Intermediary, Aerospace sector).

Clearly for manufacturers, this knowledge is likely to be less exclusive than for their own products.

Customer-focused methodologies

Our data supports the idea that offering advanced services can require manufacturers to develop service methodologies that align to customers’ processes. Technical expertise concerning products

must therefore be coupled with knowledge of how customers perform product-related activities, e.g., operations and maintenance:

"We are working with them in a long-term relationship to help optimise how we run the laboratories from a process point of view." (Customer, Health sector).

Ultimately, manufacturers must be able to offer customers an improvement on what they can do themselves or what competitors can offer, in terms of cost, service quality and innovation.

An implication of providing customer processes is that the contractual relationship between the manufacturer and customer might change, with 'gain share' or risk/reward contracts more prevalent. Manufacturers need to be able to assess and manage risk for these offerings and price them in such a way that they are attractive to customers, but are still profitable. A key element here is that manufacturers and customers need to have an agreed set of operational data on product performance on which such services can be based.

Developing a services culture

In order to deliver advanced services there is a need for manufacturers to shift to a more service orientated organisational culture:

"So if you were to take a design and manufacturing company and go into the service sector there's undoubtedly got to be a large cultural change." (Manufacturer, Defence sector).

Developing a service culture is often quite difficult for manufacturers who are used to designing and building complex high-value products, e.g., talented engineers might view their future careers in product engineering rather than services. Thus, senior managers need to carefully re-position the new company focus in the minds of all stakeholders, e.g. employees, customers, shareholders and identify potential blockages in terms of processes and rewards structures that might inhibit the new culture from flourishing.

Thus, designing and implementing suitable service processes becomes not just a technical issue, but one requiring the recruitment of qualified engineers with the willingness and aptitude to work in a more service-oriented, customer-focused environment.

Network relationships

Offering advanced services fundamentally requires very strong and trusting customer relationships:

"Having the relationship is pretty much key to our success" (Intermediary, Construction equipment)

Genuine partnerships are required to enable manufacturers to understand those elements of the customers' businesses for which improvements can be made. Trusting relationships may evolve through an appreciation of each other's values, rather than simply an appreciation of a track record.

Relationships with other actors in the network are also important, with partnerships between OEMs allowing the scope of advanced services to be extended, if one acts as the prime contractor. If OEMs are to work together then trusting relationships are critical, with both parties needing a strong partnering ethos, with an acceptance that one company often cannot develop and deliver advanced services alone.

Relationships between a service provider (without their own product portfolio) and an OEM can also be important as the parties might be able to work together better than two OEMs, for whom competitive issues might dominate the relationship.

Service innovation

Service innovation will often start with new customer requirements, perhaps to reduce costs or to perform an activity in a better way:

“Our technology people meet with them regularly ... we also discuss innovations with them on a regular basis” (Customer, Government sector).

Manufacturers are likely to need to develop new methodologies to enable customers to perform their processes more innovatively. For example, Web-based technology including telemetry can enable a manufacturer to better manage the installed product base and react quickly in the event of outages or faults.

Customer intimacy

Having an intimate understanding of the customer's business challenges is a key requirement:

“They understood what we were on about and how we were developing” (Customer, Government sector).

To achieve this, the manufacturer's account managers need to be able to understand what these problems and requirements are in order to deliver effective solutions.

Services infrastructure

Having an extensive service infrastructure local to the customer can also be a differentiator, be it offices, engineers or even holdings of spare parts:

“(We) see it as being important to participate more locally, closer to our customers and we're benefiting from that.” (Manufacturer, Power sector).

For the largest customers, a manufacturer might locate its service engineers in the customer's site to provide fast resolution to problems encountered.

A manufacturer might also develop a large-scale service capability, perhaps off-shored to dedicated service centres, to achieve a critical mass for delivering that service. Off-shoring can help to deliver efficiencies and cost savings which might not be possible by the customer alone. These service centres might undertake a range of back-office functions, such as technical support and software design.

Tailored and consistent service offerings

Manufacturers need to provide consistent and timely service offerings. Providing a degree of flexibility in the service offerings can also be seen as an important requirement for manufacturers:

“It's ability to respond, it's the ability of them to fix whatever needs to be fixed” (Customer, Transportation sector).

Whilst complete flexibility is unlikely to be possible, having a degree of modularity in each service offering (e.g., differing response times) will allow customers to select the one most suitable for them and allow variation as their requirements change.

5 DISCUSSION

5.1 Implications For Theory

The study's aim was to investigate the capabilities demonstrated by firms developing advanced services. Initial findings show eight capabilities for developing and delivering advanced services. Whilst some previous studies have identified capabilities for servitization (e.g., Storbacka 2011), this study is one of the first to specifically address capabilities for advanced services. Given that these services should enable customers to better perform their business processes (Baines 2013), the capabilities that underpin them are necessarily relational in character and may require deeper investment in people, technology and infrastructure than base and intermediate services. By offering advanced services firms also need to develop new approaches to service specification, delivery and payment (Baines and Lightfoot, 2013).

The study highlights differences in capabilities between manufacturers and intermediaries, e.g., manufacturers have deep product knowledge of their own products, whilst intermediaries are able to build infrastructure close to the customer, which a manufacturer might not be willing or able to do. Additionally, the study identifies the same set of eight capabilities as being important to customers; providing verification of their importance.

Template analysis has facilitated the identification of overlapping and related capabilities for the provision of advanced services. Future research should investigate how separate actors collaborate to develop network capabilities (Raddats *et al.*, 2013) that are more effective than what could be achieved independently. This should involve further investigation of how relational activities and balanced innovative capabilities can be developed to deliver successful advanced services.

5.2 Implications For Practice

Managerial implications of this research include the need for manufacturing firms to balance the need to retain personnel with deep technological product knowledge whilst at the same time implementing organisational change that creates an improved service-centric culture. This may require retraining or exiting staff, or recruitment of new staff versed in solution selling or designing and implementing service methodologies. Equally, a clear managerial lead is required to re-position the company as a provider of advanced services in the eyes of its key stakeholders, be they customers, employees, suppliers and intermediaries or shareholders. Identification of the eight capabilities offers a guide of where managers should focus investment for advanced services.

In terms of providing tailored solutions, it is also clear that firms should develop innovative service methodologies and infrastructure in order to improve customers' operational processes, reducing risk and controlling costs. Manufacturers and intermediaries potentially possess complementary but distinct capabilities for the provision of advanced services. Whilst customers may value the expertise that manufacturers, intermediaries or a combined network can provide, they are only likely to want these advanced services if they offer clear benefits over what can be provided in-house or by competitors.

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CUSTOMER DRIVEN BIG-DATA ANALYTICS FOR THE COMPANIES' SERVITIZATION

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ABSTRACT

In the era of Big Data, huge amount of the operational data is generated by every manufacture, and even more - human-generated information (unstructured data) is increasingly created on the Web. The companies can profit from a capability to collect and analyse this data and use it to improve a key feature of the servitization – strong customer orientation. For instance, the CEM (Customer Experience Management) focuses on handling the experience during the interactions with customers across every touch. And, it brings in not only an analysis of hard metrics, but also customer emotional characteristics (i.e., their feeling, sentiment). Thus, to succeed in the era of the unstructured content, companies must take a holistic approach, by addressing 100 percent of their enterprise data - both unstructured and structured. Besides, understanding of the human-generated information requires a fundamentally new approach that uses technology to deliver insight, ideas, and intuition into the rapidly growing and diverse data that we deal with every day. This approach takes all processed data and evaluates its meaning within the context of the entire pool. Therefore, in this paper we describe what the ICT capabilities are required: (1) to understand and use the detailed customer behavior data including that generated by social media; and, (2) how it can be discovered the value of the Customer Experience insight of that data, with increasing service personalization, and within the customer-oriented approach on the companies' servitization way.

KEY WORDS: Customer Experience, Big Data, Text Analytics.

1 INTRODUCTION

Currently most of companies are aware of an importance of the customer experience. They agree - developing customer experience must be considered holistically. Besides, corporate culture and passion for customers must be involved as well (Kryvinska 2012; Stodder 2012). Soudagar *et al.* (2012) in his book introduced “four customer experience essentials are reliability, convenience, responsiveness, and relevance.” These essentials must be incorporated into the corporate culture across whole company. Soudagar *et al.* (2012) further determined that “a cultural change is required to change the attitudes of everyone within the organization when it comes to how the customer is viewed”.

To be able to process continuously growing amount of data (i.e., big data), including data from social media, organizations must implement more and more complex information systems. In this way new technologies play increasingly important role and are directly involved into the decision making process (Berman 2013; Cerra *et al.* 2013; Isson and Harriott 2013; Kryvinska *et al.* 2014).

2 CUSTOMER EXPERIENCE

McDonnald (2013) examines practices and methods to “deliver an exceptional experience to people who are not like you”. The requirements for creating a customer experience “*that addresses a specific customer group’s needs and wants, you can differentiate yourself from your competition and grow your business with new, incremental customers*”. The customer experience does not rise in the moment when he/she buy something. In majority of cases, it is a consequence of often very specific findings or experience obtained before. In addition, however, it is not visible from the first look, what a customer feels and passes after his/her purchase. By other words, it is important “every aspect of doing business with you” because “Customers’ impressions of you and your product or service depends on the total experience”. We can specify the funnel analogy for customer experience and related matters.



Figure 1: Purchase Funnel (McDonald 2013)

The funnel analogy displays accurately customer behaviour from his/her first engagement through getting an opinion about a service, then starting to consider seriously this service, and finally - excite a customer enough that he intends to purchase this service. Although the company reaches its goal and customer buy this service - organization must continue to “hug a baby” during Loyalty and Advocacy funnel stages.

According to McDonald (2013), the Advocacy is “the best stage of all because this is when customers are not just satisfied with your product, service, and the entire experience but actively sell for you. They tell everyone they know about you and why they love you. They influence others. They become walking and talking ads for you”.

In turn, an organization must implement some technologies to cover one of the main customer experience principle (Soudagar *et al.* 2012) “*Customers don’t need to listen to you; you need to listen to customers and incorporate those new insights into your processes*”. Soudagar *et al.* (2012), for being customer-centric, specifies three pillars of customer experience (e.g., framework of excellence):

- Operational excellence,
- Customer interaction excellence,
- Decision-making excellence.

Soudagar *et al.* (2012) also proposes to use listed pillars for “choosing supporting technologies that enable you to create the customer experience edge”. He (Soudagar *et al.* (2012)) specifies the following elements that can influence the future of the customer experience:

- Real-time computing
- Social Media use
- Mobility/online customer experience

- Customer Service
- Product development
- Business Models



Figure 2: Three Pillars of Customer Experience (Soudagar *et al.* 2012)

In the Forrester's survey (Forrester 2012), there are evaluated: the challenges companies face in the customer experience, and the investments they have made in customer experience technologies to overcome those challenges. According to this survey, three main agents' challenges are as follows:

- search the related information, needed for resolving customer inquiries,
- arranging the collaboration with subject experts,
- accessing customers interaction history.

Mentioned above topics are related to the search information system and knowledge sharing including text analysis from Social Media and other Big Data sources (Wegener and Sinha 2013; Zikopoulos *et al.* 2012).

Also according to this survey, contact-center technology' environment is complex and mainly consists "of point solutions that are used to manage voice, text-based and social media types, voice and web self-service interactions, case management solutions, integrations to customer relationship management (CRM) systems, knowledge management systems, internal collaboration tools, presence indicators, quality monitoring, and workforce management systems. Little integration exists between these technologies" (Forrester 2012).

The (CMA 2013) discusses the core aspects of a customer experience program and the ways they interconnect. As it is highlighted "The role of tools here is not necessarily to create an all-encompassing picture, but rather to focus organizational efforts on the best opportunities while addressing key challenges or obstacles". The (CMA 2013) concludes: "Through the use of strategic tools and insights, organization-wide approaches to implementation, and focused measurement, the ultimate goal is to think like a customer.

Following Forrester's report (Forrester 2013), it is hard to deliver good customer experience "because many companies have not been able to align the experience that they deliver to changing customer demand".

Furthermore (Forrester 2013), "However, to provide positive social customer service experiences, companies must define their customer experience strategy and ensure that their customer service operations are aligned with and support their company strategy".

3 IT CAPABILITIES

The typical example of business and IT alignment is presented in servitization (Baines and Lightfoot 2013b; Benedettini *et al.* 2013; Kryvinska *et al.* 2014). The idea of an integrated product-service system (PSS) is the essence of servitization (Hou and Neely 2013; Tether and Bascavusoglu-Moreau 2013). Baines and Lightfoot (2013a) claim that "Successful delivery of advanced services is enabled by information and communication technologies that are focused on informing and advancing actions of maintenance, repair and use". He examines and specifies the overall architecture of a typical ICT

(Information and Communication Technology) system, and then describes each element of the system in turn. He also finds that “*ICTs used in the delivery of advanced services*” focus on “*providing the manufacturer with visibility of their product (or asset) as it is used by the customer*”. Baines and Lightfoot (2013a) describe a common architecture for such ICT systems with five functions: monitor, transmit, store, analyze and respond. And, a very important part of ICT in servitization is analysis of sensor data. It is quite difficult to discover symptoms that occur less frequently. In this case, it is used information that can be gathered by manual observation by a field technician, conversations with the aircraft crew, or feedback from other customer staff. Feedback is also ultimately received from maintenance and repair actions. Thus, the integration of ICT with supporting management processes (Kryvinska *et al.* 2014) is a basis to the primary value proposition (Kryvinska *et al.* 2013) of cost-effective delivery of service. Achieving the required changes can present a significant organizational challenge to companies delivering product-centric services through the use of enabling technologies (Baines and Lightfoot 2013b; Kopetzky *et al.* 2011; Louis *et al.* 2013; Mladenow *et al.* 2012; Stoshikj *et al.* 2013).

On the other hand, Keyes (2013) describes intelligent system as a highly distributed intelligent-agent-based system. He categorizes agents in different ways “*based on their mobility, based on their intelligence, or based on the roles they play in an agent-based system*”. These agents are able to provide the following capabilities

1. Cooperative agents communicate with other agents, and their actions depend on the results of the communication.
2. Proactive agents initiate actions without user prompting.
3. Adaptive agents learn from past experience.

Keyes (2013) listed the following roles of intelligent agents in supporting processing data from Social Networking: “*create, combining, distributing and retrieving knowledge*”. In the heart of an Intelligent Engine are capabilities related to the text mining. The importance of the text mining is growing and obtains increasing attention because of the large amount of unstructured (mainly text) data that are created in the organizations and in different social networks.

Aggarwal and Zhai (2012) itemize the following algorithms for the text mining:

- Information Extraction from Text Data
- Text Summarization
- Unsupervised Learning Methods from Text Data
- LSI and Dimensionality Reduction for Text Mining
- Supervised Learning Methods for Text Data
- Transfer Learning with Text Data
- Probabilistic Techniques for Text Mining
- Mining Text Streams
- Cross-Lingual Mining of Text Data
- Text Mining in Multimedia Networks
- Text Mining in Social Media
- Opinion Mining from Text Data
- Text Mining from Biomedical Data

Aggarwal and Zhai (2012) expose a traditional framework for Text Analytics, in which he conceptually defines Text Preprocessing, Text Representation and Knowledge Discovery. Text Preprocessing methods are used to reduce amount of words. Text Representation transform the text corpus into numeric vector, on which further machine/data mining methods (like classification or clustering) in Knowledge Discovery are applied.

An Enterprise Intelligent System conceptually should consist of:

- Application Framework
- Rules Engine
- Analytics tool
- Intelligent Engine
- Connectors

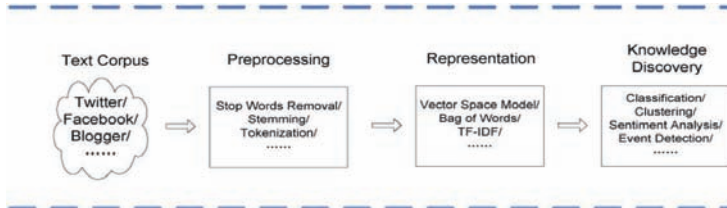


Figure 3: A traditional framework for Text Analytics (Aggarwal and Zhai 2012)

On the top of this architecture are APIs (Application Programming Interfaces) those provide IT capabilities and allow to compose flexibly business specific application. Such applications cover different business requirements. A Rules Engine/BPM increases traditional Enterprise Search Engine and allows implementing certain kind of business logic that can use Intelligent Engine to deliver more sophisticated and more relevant answers. Analytics tool provides capabilities for data and information processing to discover enhanced insight and decision making. Core of this architecture is Intelligent Engine that covers such capabilities as:

- Conceptual search
- Advanced search methods
- Categorization
- Clustering
- Sentiment analysis
- Hyperlinking
- Entity extraction
- Personalization
- Audio analytics
- Video analytics
- Image analytics

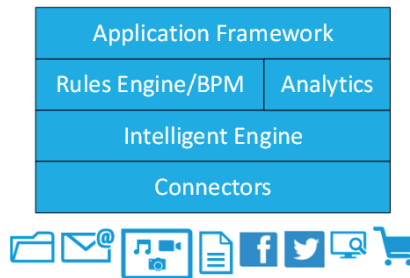


Figure 4: Architecture of an Enterprise Intelligent System

Connectors represent an integration layer and the boundary between data sources and Enterprise Intelligent System. Most of systems consist already of a set of connectors to standard system or social media.

4 CASE STUDIES HP APPROACH TO THE ENTERPRISE INTELLIGENT SYSTEM

HP IDOL 10 represents a single processing layer that is able automatically unlock key ideas and concepts in all available information, structured and unstructured. With IDOL 10 one can understand and act upon documents, emails, video, chat, phone calls, social media, and application data at the same time and faster than ever before (Autonomy 2013a, Autonomy 2013b).

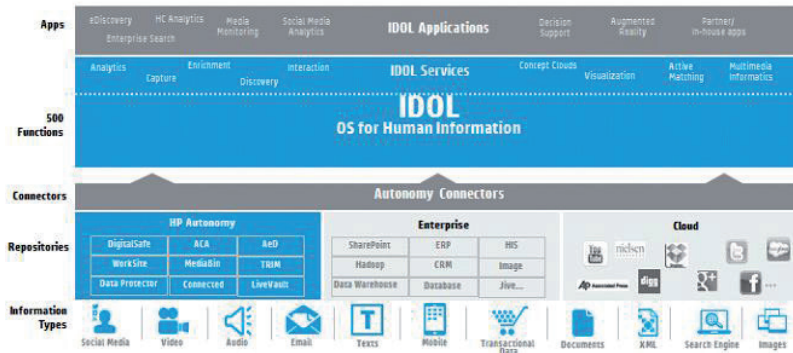


Figure 5: Architecture of IDOL Solution (Autonomy 2013a)

IDOL 10 powers many of the applications those depend upon an understanding of human information to perform, including (Autonomy 2013a, Autonomy 2013c):

- Enterprise Search
- eDiscovery
- Voice of the Customer/Workforce
- Marketing Optimization
- Enterprise Content Management
- Social Media Analytics

Additional features and functions available in IDOL 10:

- High-performance analytics – with enhancements in text, audio, video, and image analytics
- Social media analysis – with innovations in sentiment analysis
- An enriched Hadoop ecosystem – with various ways to combine IDOL and Hadoop capabilities to better analyze unstructured data
- Easy to use and administer – with a visual dashboard and simplified processes
- Reliable and robust – to increase performance while reducing down time

5 CONCLUSION

Keyes (2013) characterizes Autonomy an HP company as a leader in meaning based computing “Autonomy’s Meaning-Based Computing platform, IDOL, is capable of processing any type of information from any source. IDOL can aggregate hundreds of file formats, including voice, video, document management systems, e-mail servers, web servers, relational database systems, and file systems”.

In this paper we respectively refer shortly to the particular parts of the customer experience and highlighted main characteristics of the solution that understands and acts upon documents, emails, video, chat, phone calls, social media, and application data at the same time and uses advanced analytics tools (Gartner 2013; Gordon *et al.* 2013; Urikova *et al.* 2012).

We focus specifically on the architecture and functionalities of an Enterprise Intelligent System, which supports decision making by processing different types of unstructured sources. The paper also provides conceptual insights into how traditional manufacturing organizations can take over the approach of typical service industries (Telco, Tourism etc.), and shows which IT capabilities allow a significant shift in the benefits that organizations are seeking and deriving from Big Data projects.

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SERVITIZATION AND JAPAN'S KEIRETSU ORGANIZATION

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ABSTRACT

Japanese firms are having different organisational structures and management traditions than their European counterparts. Features in a risk cautious culture, a long term Keiretsu relationships for supply chain partnerships to consistently make products more efficiently (one of the best examples is Toyota's 'Just in time' lean production system), and a strong engineering skills base in design, production and quality management. However, Japan's dominance in the manufacturing sectors appears against an increasing commoditization of electronic product from a surge of disruptive innovators that are offering competitive price and quality. Servitization concept offers an alternative solution to defend against competitions through advanced services, this study reviews the key features of business system in Japan and link with resource- capability based lens to view how Japanese organisations can leverage their existing resource and develop capabilities into offering advanced services.

Keywords: Servitization, Japan Organization, Keiretsu

1 INTRODUCTION

The literatures suggests that the Japanese business organization is designed to be economically rational. Japanese firms often take a long term view and operate through highly coordinated 'Alliance Capitalism' (Gerlach, 1992).

Japan's high dependence on export economy and slow change among inter-corporate groups has made Keiretsu model highly susceptible to global economic crises and increasingly vulnerable to a surge of disruptive innovators that are offering competitive price and quality. The servitization concept offers an alternative solution to defend against competitions and smoothen revenue flows through advanced services. Servitization is delivered through product service systems to increase value in use, is now a central theme for business practitioners and policy makers worldwide. However, awareness of servitization is new to many Japanese manufacturing firms, especially servitization application to the Japanese keiretsu systems.

Our paper use resource and capability lens (Ulaga and Reinartz, 2011) to articulates four dimensions of the advanced services and the keiretsu business systems, including supply chain collaboration, organizational structure, innovation systems and processes. The purpose is to identify area of fit between keiretsu business system and servitization. Our study has observed underestimated opportunities of servitization transformation from institutional relationships in the forms of keiretsu business group to deliver advanced services.

2 BACKGROUND

Servitization is a new business concept, it is the process of transforming manufacturers to compete through product service systems (PSS) rather than product alone. Manufacturers requires to embrace a broader range of offerings from traditional product sells to becoming services provider. The novelty of servitization is more than product based innovation, it is guided by business models that drives production and design competencies to improve customer's processes and their business outcomes (Baines and Lightfoot, 2013a). Servitization offers attractive propositions to manufacturers to enable them expand their market, establish long term contract and defend them from competition based in lower cost economies (Baines et al., 2009, Shi et al., 2013).

A key feature of the industrial growth in post war Japan had been the use of the keiretsu networks. A keiretsu was defined as inter-corporate group alliances that had cross ownerships, personnel exchanges, president's club with regular meetings and bank financing between themselves (Sanyal, 2000). The vertical and horizontal keiretsu shapes the Japanese business model, belongs to a keiretsu can influence transaction between member production system (supplier system) and a system that restricts distribution and price both vertically, within keiretsu groups, and horizontally, across groups.

A key function of horizontal keiretsu is their organization around a main bank to finance makers of goods as well as *sogoshosha* - general trading companies that circulate these products. For example, in the Mitsubishi keiretsu network strong ties among Tokyo-Mitsubishi UFJ Bank, Tokyo Marine & Fire Insurance, Mitsubishi Motor, Mitsubishi heavy industries and Mitsubishi Trust Bank, among others. These individual firms conducted joint research and development on new products and processes. As a family they built around a core bank, Bank of Tokyo-Mitsubishi (Yorozu et al., 2013).

On the other hand, the vertical keiretsu structure allows subsidiaries and affiliated companies to build up long term relationships with their parent companies. For example, Toyota was included in the Mitsui group, and was comprised of 250 companies. Toyota introduced the supplier system 'just in time' lean production system (Lincoln et al., 1996), resulting in high profits.

After the bubble burst, recession and environmental change caused an increase in the number of keiretsu networks that dissolved. However, recently these keiretsu networks have been reevaluated by companies including the companies that dissolved them. In 2005, Nissan increased the stake in Calsonic Kansei Corporation, which specializes in the production of modules assembled from multiple parts, from 27.6% to 41.7% according to Web Japan (2005) 70% of profit resulting from reduction of costs related to subcontractors in 2000. Moreover, Honda had difficulties selling its automobiles in Japan without a keiretsu connection, so it asked suppliers to cooperate in boosting productivity to keep pace with the growing Chinese economy (*ibid*). Most companies, including foreign ones, have again become interested in the keiretsu network because the keiretsu provided a possible means to cut costs and meet high demand in China. Thus these vertical keiretsu networks will continue to exist and contribute to Japanese economic growth.

3 SERVITIZATION AND KEIRETSU

3.1 Supply Chain Collaborations

Manufacturing organization offering advanced services often extend responsibilities downstream in a relationship style contract along a manufacturers' supply chains (Baines and Lightfoot, 2013b). In particular, engagement at the subsystem level (Baines and Lightfoot, 2013a). Often, the manufacturers offer goods that sells below the cost of production, rather, they engage revenue streams from through life services of the installed base product. For example, large OEM in aerospace manufacturing often sells their assets at cost price to airline operators, to allow them to gain after market services (Rossetti and Choi, 2005).

The 'free-model' that often bundled in advance services was also found in product strategies deployed by Japanese keiretsu firms. The keiretsu firms has been aggressive exporters of their manufactured goods to gain market share, often at the expense of immediate profit (Brown, 2001). But, unlike the western style shareholder pressure, the 'in-house' keiretsu bank were not concerned

with receiving dividends from profits (*ibid*). For example, the firm involved in the exchange may not directly profit, but opens doors for other keiretsu members to generate new demand from product and service sells. The opportunities to capitalize on spillovers provide keiretsu member organizations with gains otherwise unattainable without group membership (Delios et al., 2010).

Manufacturers offering advanced services has no other choice but to work collaboratively with their supply chains (Shi et al., 2012). The advanced service providers critically evaluate outsourcing decisions and keep critical activities 'in-house', for the purpose to enable quick responses at customer's operations (Baines and Lightfoot, 2013a). Keeping a 'tail' of critical manufacturing capabilities through vertical integration can help advanced service manufacturers to defend against threats from the potential entrants (*ibid*).

Similar sourcing behavior was observed with the keiretsu systems, which carries out two types of outsourcing practices, the offshore subsidiary sourcing from (*kankei kaisha*) strategic suppliers and the conventional offshore sourcing from (*dokuritsu kaisha*) independent suppliers (Czinkota, 2009).

The shift from base to advanced services changed the service network, managers need to align operations throughout the entire business network, involving both downstream distributors (Baines and Lightfoot, 2013a) to stay close to vendors that can provide early information on shifts in the market (Choi and Linton, 2011) and upstream component suppliers (Gebauer et al., 2013) to reduce total cost of the goods and sense supplier's innovation potential (Choi and Linton, 2011).

The keiretsu systems stabilize management from market turbulence (Aoki, 1988), that can prevent takeovers and avoid sub-system suppliers to bypass in direct contact with customers. The group members relationship is strengthened through gain sharing and 'preferred' access to technology developments generated by keiretsu firms (Delios et al., 2010).

The keiretsu system carry out supply chain coordination with less reliance on institutional arrangement (Delios et al., 2010). Instead, functional integration is achieved among keiretsu members working together with close proximity to the market (*ibid*). The internationalization activities follows an established patterns as in domestic market. For example, when leading keiretsu firms decide to go abroad, other members can follow to replicate the domestic supply relationships, their facility location decisions is based upon the close proximity to the needs of a major Japanese customer. The internationalization and coordination experience learned through close proximity to customer operations can be leveraged to offering advanced services.

3.2 Servitization Organizational Structure and Keiretsu

Advanced service manufacturers can develop capabilities for a platform of services, varying from base, intermediate to advanced level on a global scale. Offering a platform of product and services with global reach allow manufacturers to gain competitive positioning by defending them from potential disruptive innovators (Christensen and Raynor, 2003) and control critical manufacturing and service components (Fischer et al., 2010).

Manufacturers that are effective in managing their keiretsu networks can withstand turbulent times. The keiretsu networks through sharing stocks allow individual company to keep the lowest possible dividend, and keep keiretsu companies' stock prices high for equity finance (Aoki, 1988). As a result, keiretsu firms could increase their capital at a high stock price as well as issue the above bonds with low interest rates. Raising large sums of money at low interest rates was a great advantage to companies joining keiretsu networks (*ibid*).

For example, Mitsubishi Keiretsu was able to seize opportunities in both developed and developing market, such as the Tokyo Mitsubishi UFJ was able to position a timed strike by raising \$9 billion for a 21 percent stake to rescue Morgan Stanley at the 2008 U.S sub-prime crisis. The Mitsubishi Chemicals rapid entry into India's chemical processing industry to allow growth alongside with the emerging economies. At the same time, Mitsubishi Motor collaborate with India's Mahindra and Mahindra for developing latest farming equipment for the customer needs from emerging market (Jones, 2012). Domestically, Mitsubishi Heavy Industry collaborate with Toyota Motor for developing Mitsubishi Regional Jet to allow strong presence in Asian and Pacific markets, directly compete in the same league with established players such as Embraer and Bombardier regional jets (Vasigh et al., 2012).

Transformation into servitization depend upon a world-class capabilities in operations management. For example, after the bubble burst, Toyota dispatched executives to Denso, Toyota Industries Corporation, and Aisin, which belonged to the same keiretsu. Toyota emphasized human resources within the keiretsu network, which led to high efficiency. Toyota purchased its components from suppliers at a lower rate than Nissan, which had significant dissolution of the keiretsu. According to Takarabe (2002) Nissan's purchasing cost accounted for 60% of all costs, which equaled 58% of sales.

3.3 Servitization Innovation and Keiretsu

The industry economy demanded individual effort on an assembly line, the knowledge economy itself demands collaboration (Shelton, 2013). Different stage of research innovations can be developed and co-created with outside partners. Advanced services is enabled by new modes of communications, characterized by multiple customer touch-points, generating various demand signals and necessitate different forms of response from the host organizations (Baines et al., 2009). Manufactures can better position themselves with manufacturing processes that are agile and adaptive (Baines and Lightfoot, 2013a), with flat and synchronized management structure that focus on knowledge sharing through supply chain collaborations (Rolstadås et al., 2012).

The art of Japanese keiretsu management features personal communication, love of tacit knowledge, frequent job rotation and strong group orientation allow employees to share ideas (Haghirian, 2010). For example the Toyota lean manufacturing techniques is no longer emphasis about cost on labor and equipment utilization, but rather on reliability, flexibility and speedy throughput time (Hayes, 2005). Knowledge creation and transfer tend to be incremental, decentralized and outsourced along the (Keiretsu) business systems (Rolstadås et al., 2012).

Advanced services requires organizations to share knowledge from shop-floor to field service technicians. The keiretsu systems promote knowledge sharing and storage by locate senior managers to work at suppliers site. Although the retiring age is officially 60, all employees except executives are forced to move to their subsidiaries within a same keiretsu before around 45-50 years old, and they work there until 60 years old (Dore, 2000). The capabilities developed through relentless pursuit of perfection to quality and knowledge sharing through cross functional teams can help keiretsu firms evolve into advanced service offerings.

In contrast to lean production systems, where the learning focuses on organizational processes, the advanced service operations requires worker to have both high level product knowledge and an ability to manage and develop ongoing customer relationships (Baines et al., 2009), which may require more autonomous, decentralized knowledge sharing and learning to cultivate entrepreneurial spirit of each individual employees.

3.4 Servitization Processes and Keiretsu

Manufactures delivering advanced services by integrating into a wide range of customer activities, through extensive front office and purposefully retains capabilities in design and production at the backend to benefit speed, effectiveness and costs of supporting assets (Baines and Lightfoot, 2013a, Baines et al., 2011).

The biggest fears to advanced service offerings come from manufacturer's insufficient capabilities to delivery required service level agreement (SLA). Product and processes development knowledge enables manufacturers to explore new opportunities (Rolstadås et al., 2012). However, developing process capabilities takes time, Japanese keiretsu manufacturers spent decades improving the precision of their manufacturing processes, fast response supply chain through Just in Time (JIT) and instilling a climate of (Kaizen) continuous improvement and (Hansei) reflection toward perfection before they gained many high ground in global manufacturing landscape (Hayes, 2005, Belal et al., 2014).

The keiretsu process management were developed overtime through continuous improvement and some time it evolves naturally under critical moment (Lawler and Worley, 2011). For example, Toyota's keiretsu established a 'war room' style practice in the event of the 1997 Aisin Kariya plant fire (ibid). The scale of damage from the P-valves manufacturer was large enough to take down more than 0.1% of Japan's annual industrial output (ibid). During recovery, the Toyota keiretsu system has

demonstrated a superior flexibility to recombine multiple resources without a formal hierarchy, central direction and budgeting, and a week later the daily operation was at pre-disaster level (ibid).

3 CONCLUSION

Our research indicates that the Japanese keiretsu style sourcing, cross shareholding, and open access to technology development among keiretsu members share similar characteristics with collaborative style in advanced services.

The relational collaboration and control among keiretsu members can benefit efficient delivery of advanced services. The keiretsu style financing model can be replicated to bundle advanced services, and the keiretsu subsidiaries facilities are often located around customers operations, their experience in replicating overseas facilities and establishing supplier networks can help to accelerate the pace of integration into advanced services.

However, the differences exists where keiretsu organization has an internal orientation, where advanced services manufactures often bundle product from competing manufacturers or other keiretsu group. The keiretsu management philosophy has a strong emphasis on loyalty, alliances with outside that may conflict with internal keiretsu was often perceived to be unacceptable by many Japanese managers. Thus, loyalty in keiretsu system can be two edge swords to transform into advanced services.

The keiretsu system focus on sharing knowledge, cross functional team collaboration, frequent job rotation and life time employment are beneficial to knowledge systems required for advanced services.

However, the knowledge management in advanced services requires more transparency, explicit type of knowledge deposited and transferred through advanced ICT technologies. The leadership style has to move beyond 'closed-door' to open communication at customer's operations. In industries where the nature of the work depends on knowledge, creativity and inspiration, individuals are more likely to play critical role in explaining performance differences (Mollick, 2012). Star scientist and research intensive institutions are less likely to use hierarchical management structures and managers can be at lower pay grades than their more knowledge workers. Companies need to provide critical resources to cultivate innovative ideas that lead to competitive advantage. The keiretsu system relies on tacit and personal progression are based on length of service rather than individual performance, that can potentially inhibit knowledge sharing in advanced services.

Finally, the keiretsu process capabilities can be leveraged into developing new product service systems, experience from risk recovery, resource capacity reconfiguration and fast response to demand are transferable skills to be exploited for offering advanced services.

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FRAMEWORKS AND ANALYTICAL TECHNIQUES

THE MANUFACTURER'S SERVITIZATION PROCESS: A PROPOSAL FOR A DECISION-MAKING MODELING FRAMEWORK AND DIAGNOSIS

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ABSTRACT

Servitization can provide significant economic opportunities, but its implementation in the industry remains surrounded by much uncertainty. This is due to the complexity of its decision making process. This research work focuses on decision making process followed by one industry during a servitization transition. The paper aims to introduce a framework of risk occurrence anticipation and analysis within servitization decision process. This is based on an innovative approach of decision reliability diagnosis. For this, we adopt a methodology typical of enterprise modeling and diagnosis domain, illustrated by a case study.

KEYWORDS: Servitization, decision process, reliability, risk occurrence

1 INTRODUCTION

Servitization and product service systems (PSS) concepts and applications have spread during the last decades in the academic and practitioner communities (Hou and al, 2013). In many advanced economies, servitization is thought as a development approach able to provide opportunities to achieve sustainability, improve enterprise competitiveness, and better satisfy customer needs (Vandermer and Rada, 1998). Nevertheless, this paradigm shift requires questioning the business objectives and overall functioning. PSS are not based only on technical aspects, organizational aspects are also involved, which make the implementation of this concept in businesses more difficult (Cook and al., 2006). Thereby, transition from product manufacturer into service provider constitutes a risky managerial challenge (Oliva and al, 2003; Nudurupati and al, 2013). It involves the company in a dynamic and

complex decision-making process. Therefore, it becomes necessary to provide decision makers with tools to manage the process, and to anticipate associated risks.

This research work introduces a modeling framework of servitization decision making process, and decision reliability diagnosis. The purpose of the paper is to propose a method for risk occurrence anticipation in a servitization transition, to help decision-maker controlling the process. This paper consists of three main parts. First, we introduce the basics of the servitization process, risk analysis, and reliability notion. In the second part, we explain the decision modelling and the reliability assessment approach we propose. Finally, the aim of the third part is to illustrate the diagnosis approach and risk interpretation according to a case study of a French firm.

2 SERVITIZATION PROCESS, RISK ANALYSIS AND DECISION RELIABILITY

2.1 Servitization decision process

Servitization can be understood and formalized as a complex process to make enterprise transformation (Oliva and al, 2003). Servitization leads to rethink the enterprise strategy, internal processes and competencies as well as its external networks. On the basis of a bibliographic analysis (Oliva and al, 2003; Baines and al, 2009; Gebauer and al, 2012) and experience feedbacks from different leaders of industrial companies in a servitization transition, the global servitization process can be decomposed in 3 decisional issues which cover key dimensions of the business transformation (Dahmani and al, 2013): **1.** The product service system (PSS) technical design; **2.** The PSS business model transformation; and **3.** The organizational changes, required to support the PSS implementation. Each of these decisional issues contributes to redesign the positioning of the firm in its ecosystem. Indeed, the first decision issue emphasizes services' intangible nature (Baines and al, 2009). The second issue focuses on the importance of predicting the market behavior vis-à-vis this new offering (Vandermerwe and al, 1988). And, the third issue considers the importance of adapting organizational structures and processes to ensure congruence between the firm's resources and objectives (Gebauer and al, 2012).

We define servitization as a transition decision-making process, which generates information and knowledge progressively through temporal sequences according to each specific context. This is the system adopted by an organization to move from a current economic model (product-oriented offer) towards a servitized economic model (integrated product and service offer). This decision-making process is decomposed in three decision Macro-processes (MP) according to servitization decisional issues underlined: MP1: the product service system (PSS) technical design; MP2: the PSS business model transformation; MP3: the Organizational changes, required to support PSS implementation. Coordinating these three decisional issues simultaneously can be problematic for the decision-maker; he has to take into account the complexity of the process and its dynamic evolution over time. This transition is then considered risky and full of uncertainties for the decision-maker.

Then, preparing a servitization process may be compared to a project planning for the manufacturer. He will need a planning tool in order to control the process and to minimize uncertainties and attached risks.

2.2 Risk analysis in servitization process

The term risk is used in a wide range of meanings. According to literature, risk in business can mean either a feared event, or the probability of occurrence of the event, or its harmful consequences (Courtot, 1998). Project risk often refers to any departure from the planned objectives related to performance expectations (Girard, 1991). According to a quantitative approach, risk refers to the exposure to loss/gain, or the probability of occurrence of loss/gain multiplied by its respective magnitude (Jaafari, 2000). Risk therefore can be defined as "an uncertain event which, occurrence would have an effect on achieving the objectives" (Schmitt and al, 2013). Risks can be classified in several ways. It depends on the specificities of the project, the company and the ecosystem (Schmitt and al, 2013).

Generally in risk analysis modeling, it's important to differentiate risk factors from risk impacts. According to a reference model we adopt (Gourc, 2006), every risky situation is due to a combination

of causes (origins) brought together in an occurrence area, and generates a set of impacts (consequences) brought together in an impact area. The risk event represents the intersection between both of the distinct areas.

For a manufacturing company, servitization represents a transforming project which affects all strategic pillars of the business. Literature often emphasizes internal and external barriers faced by a firm in servitization process (Mont, 2004; Hou and al, 2013). Servitization barriers can be related to value creation issues (Baines and al, 2009). Risk related to service is mainly due to coordinating issues between business ability and market expectations on one hand and organizational strategy, design and development on the other hand (Sawhney and al, 2004), service types can also affect considerably a servitization performance (Benedettini, 2013). Studies oriented towards risk assessment for service innovations attempt to quantify risk occurrence probability and extent of losses in risk matrices, in order to propose risk management plans (schmitt and al, 2013).

We consider risk in servitization decision process as the possibility for a decision-maker to fall in a risky decision-making position, which occurrence can lead to negative consequences for conducting the process as well as for the planned objectives.

In this paper we introduce a risk analysis approach for servitization decision process focused on risk occurrence domain. We propose a diagnosis method for the decision process of a pivot firm to deduce decision areas carrying potential occurrence of risk. For this, we need to evaluate the decision process accomplished by the firm. We proceed then to evaluate the decision reliability of servitization process.

2.3 Notion of decision reliability

To define the concept of decision reliability, we refer to Simon's researches on procedural rationality. In this approach, Simon has identified procedural rationality as an important information processing and decision-making approach. Procedural rationality is *"problem solving by recognition, by heuristic search, and by pattern recognition and extrapolation [...]. They are not optimizing techniques, but methods for arriving at satisfactory solutions with modest amounts of computation"* (Simon, 1990). Dean and Sharfman (1996) redefined later procedural rationality as *"the extent to which the decision process involves the collection of information relevant to the decision, and the reliance upon analysis of this information in making the choice"* (Riedl and al, 2013).

In the context of servitization decision process, we evaluate decision reliability according to the concept of procedural rationality. Our aim is to evaluate the procedural rationality of the decision maker through evaluating the reliability of the decisions made; our final purpose is to identify the least reliable areas of the decision process.

To evaluate the reliability of decisions we consider a theoretical reference model (i.e. a reference model providing a representation of the whole servitization decisional process) which reflects a "reference optimal procedural rationality", and which is complete and consistent.

Thus, the decision reliability is considered here as an estimator of the proximity between (i) a reference decision-making process known and modeled a priori and (ii) an effective decision-making process, followed by decision-makers according to a real case study.

3 SERVITIZATION DECISION PROCESS MODELING AND RELIABILITY ASSESSMENT

In this section we introduce the formalism used to represent servitization decision process. The diagnosis approach we propose is based on this formalism. This model has been fully explained in (Dahmani and al, 2013) we just provide here a short synthesis.

3.1 Decision process modeling

We propose a model that considers the complexity of servitization decision process. This approach is inspired by the GRAI modeling formalism (Doumeingts and al, 2000) and is represented through servitization grid (in figure 1).










Decision Macro-Process Decision horizon	MP1. PSS technical design	MP2. PSS business model transformation	MP3. Organizational changes, required to support PSS implementation
H1. strategic	PS PS1. Define PSS value creation drivers PS2. Define the value proposition PS3. Define business processes		
H2. Tactical 1	PT1. Delineate the PSS structure 	PT2. Define the value architecture 	PT3. Plan organizational changes 
H3. Tactical 2	PT4. Define the PSS infrastructure 	PT5. Select the profit equation 	PT6. Establish a level of activity 
H4. operational	PO1. Plan production and characterize customer interface 	PO2. Deploy the business model 	PO3. Establish an organization of work 

Figure 1: Servitization reference decision model

To build this model, we represent decision making process through two axes. The vertical axis represents the decision's horizons: long, medium and short terms. This aspect of the decision clarifies crossing from high strategic-decision level to tactical and operational ones. The horizontal axis is related to three decision macro-processes described above: MP1, MP2, and MP3.

The intersection between a decision macro process and a decision horizon represents a decision center (DC). The model results in a matrix containing 12 decision centers (figure1). Every DC consists of decision activities (DA) nets, and every DA is represented through critical characteristics, which are differentiated according to the type of the decision activity considered. Two generic types of decision activities are distinguished: decisional activities (noted D-DA, with outputs constituted by decision choices), or execution activity (noted E-DA with outputs constituted by simple informations). This model allows understanding the complexity of the overall transition process and identifying different interaction within the system. In addition, the servitization grid makes it possible to differentiate the granularity level of the decision process from strategic to operational level and from general to particular within each DC.

3.2 Definition, formalization and evaluation of decision reliability

We have defined reliability as the proximity between reference decision making process and effective one. To estimate this proximity, the proposed approach consists in:

- Characterizing in detail the actual servitization process followed by the firm according to decision-activities (DA) of the reference model;
- Assessing qualitatively whether the different features of the reference model are present or not in the actual decision making process;
- Aggregating the first level of assessment to measure the decision-making reliability at decision activities and decision centers of the grid.

As specified above, servitization decision activities are formalized using GRAI modeling formalism and include compounds of decision activities (D-DA and E-DA). In order to build the proximity

measures mentioned, DA are modeled in detail through a set of “decision-making characteristics” and “decision attributes”, each attribute is associated with a “reliability coefficient”. Thus the conceptual modeling of the reference DA is as follows:

$$\begin{aligned} D-DA_k, E-DA_k &= \{ C_i \}_{i=1 \text{ to } n} \text{ with } C_i = \text{decision making reference characteristics} \\ C_i &= \{\text{name, description, } \{A_j, \text{Coef}_j\}_{j=1 \text{ to } m}\} \text{ with} \\ A_j &= \text{decision attributes} \\ \text{Coef}_j &= \text{Reliability coefficient associated to } A_j \end{aligned}$$

Referring to GRAI method, we describe decision activities (D-DA) by seven reference characteristics (Table 1) and execution activities (E-DA) only by five characteristics. The specific attributes of each characteristic have been identified in the reference model by detailed analysis of each specific activity of the servitization model. Table.1 provides example of characteristics and attributes for one D-DA \in PT2 (BM, MT) “*Developing the internal value chain*”.

Table 1: D-DA 1 \in PT2 (BM, MT) “Developing the internal value chain” (reference model)

Characteristics (C _i)	Input	Detailed output	Information's	Constraints	Resources	Decision variables (DV)	Objective
Attributes (A_j)	Com- ponents of internal value chain	New links created	Product Service Mix	Human resources	Competencies available	Create links	Develop the value chain to better meet the needs of the new business while respecting the available resources
	Character- istics of internal value chain	Links re- removed	Physical structure of the defined PSS (defined physical system)	Technical resources		Delete links	
		Links modified	Immaterial structure of the defined PSS (defined management system)	Commitment of the business	Duration / time required	Edit links	

The construction of these descriptive detailed tables allows determining “reliability coefficients”, which are fixed a priori for each attribute. These coefficients are determined in order to estimate an optimal reliability for each decision activity equal to 1 when effective decision activity satisfies correctly all attributes of the reference decision activity. To determine these coefficients for each decision activity, the optimal reliability of 1 is equidistributed on the different characteristics C_i: this distribution provides a reliability coefficient of 1/7 for each C_i of D-DA and 1/5 for each C_i of E-DA. This coefficient is itself equidistributed among all the attributes (A_j) components of the “decision-making characteristic”, which represents the “reliability coefficient”.

In this paper, we choose an equidistribution for coefficients among different characteristics, and attributes within one characteristic in order to simplify the analysis process. We attribute similar importance to all components of the decision making process to illustrate the overall approach, before adding a specific part to explain the weightings.

Thus, for D-DA₁ ∈ PT2 (BM, MT) “Developing the internal value chain”, there is 17 attributes, each is characterized by its reliability coefficient:

$$D-DA_1 = \{C_1, C_2, C_3, C_4, C_5, C_6, C_7\}$$

$C_1 = \{\text{input, description of incoming information from the decision-making activity, } \{(A_1 = \text{components of the internal value chain, } \text{Coef}_1 = 1/14), (A_2 = \text{characteristics of the internal value chain, } \text{Coef}_2 = 1/14)\}$

We use then the theoretical modeling of decision activities and reliability coefficients to estimate the proximity between the reference decision process and the actual one. This assessment requires collecting information from the involved decision makers, to describe quite precisely how they decide: first identify whether each of the decision activities of the servitization reference model was performed or not, then in more details if each of the attributes characterizing these activities is present or not in the actual process followed by the decision maker. We represent this measure through a binary indicator of presence (1) or absence (0) for every “decision reference attributes” in the effective decision making process of the firm: the proximity between the effective decision process and the reference one is estimated according to the absence or presence of these attributes.

To formalize this notion, it is necessary to complete the conceptual model of the decision-making activity, first by adding an index of presence/absence for each decision attribute, and a reliability estimator F_i for the decision activity. For an effective decision-making process, the activity is described by:

$D-DA_k, E-DA_k = \{(C_i)_{i=1 \text{ to } n}, F_k\}$ with F_k = reliability estimator of the DA_k ;

$C_i = \{\text{name, description, } (A_j, \text{Coef}_j, \text{Ind}_j)_{j=1 \text{ to } k}\}$, with Ind_j = presence / absence index for A_j ; with $\text{Ind}_j = 1$ if A_j is present; 0 otherwise.

The decision reliability F_k for D-DA_k activity is obtained by aggregating a sum of the reliabilities coefficients, taking into account the index of presence / absence for each of them:

$$F_k = \sum_{i,j=1}^k (\text{Ind}_j \times \text{Coef}_i)$$

$F_k = 0$ if no decision attribute is present; It is a lack of decision activity that should be detected in advance.

$F_k = 1$ if all decision reference attributes are present in the actual decision-making process; It corresponds to an optimal situation when the decision maker proceeds by following fairly the reference decision process.

4 SERVITIZATION DECISION PROCESS DIAGNOSIS APPROACH: ILLUSTRATION ON A CASE STUDY

4.1 Industrial case study: General presentation

To illustrate our approach, we propose an application on a case study of a French SME named Ecobel. The main activity of the firm is manufacturing, sale and installation of shower heads based on an innovative technique that allows water savings and protection from legionella. Its current market considers establishments receiving general public like hospitals, campsites clubs...etc. Ecobel is planning to propose a service oriented offer, so it has initiated a debate on the implementation of servitization. This case study has aroused our interest for its positioning in the transition process. Ecobel currently offers two models simultaneously: the classic range selling only the showerhead product and the integrated PSS offer selling reliable showerheads over 5 years. The PSS offer includes service contracts for regular maintenance and periodic exchange of the showerhead product with a visual identification. Ecobel's leader highlights the difficulty of commercializing it. He remains cautious about the development of the servitization model over the entire range.

4.2 The servitization decision process diagnosis approach according to a case study

In the previous section, we proposed an approach of formalization and evaluation of the decision reliability concept. Systemic vision shows that the reliability of any system depends on the reliability of its components, and their relationships among others. We suppose that an “unreliable” decision activity carries a potential occurrence of risk to the whole process which can cause negative losses for the firm.

We propose to carry out the reliability diagnosis for servitization decision process according to two complementary points:

- Reliability assessment on decision activities with the interest of submitting a macroscopic view of the process;
- Aggregated reliability assessment on decision centers with the interest of explaining weaknesses through a detailed analysis of DA.

Reliability assessment and diagnosis on decision activities

This analysis viewpoint aims to present a general state of servitization process accomplished by Ecobel at one moment. All decision activities are presented in the radar axes through a numbering from 1 to 48 (Figure 2). The advantage of this analysis viewpoint is to provide a macroscopic mapping of the reliability of the process according to the reliabilities of all DA. The contribution is to deduce a global mapping of potential occurrence of risk.

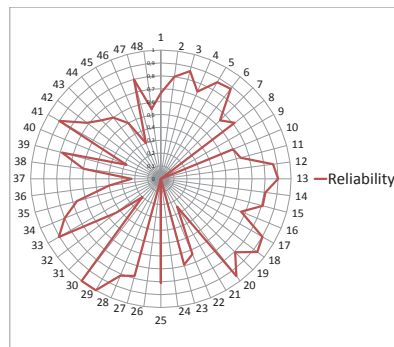


Figure 2: Reliability assessment on decision activities

Table 3: Distribution of reliabilities among intervals

Reliability intervals	interpretations	Proportion of DA in the servitization process	Potential occurrence of risk interpretation
0	DA unreliable	6.25%	
] 0 ; 0.3]	DA with very low reliability	10.42%	DA carrying very high potential occurrence of risk
] 0.3 ; 0.6]	DA with low reliability	14.58%	DA carrying high potential occurrence of risk
] 0.6 ; 0.9]	DA with average reliability	60.42%	DA carrying average potential occurrence of risk
] 0.9 ; 1]	reliable DA	8.33%	DA carrying very low potential occurrence of risk

Then, we proceed to classify the DA of the process at different reliability intervals as shown in the three first columns of Table 3. The intervals are predetermined.

Since we focus on the planning phase of an innovative process, we can only evaluate a potential occurrence of a risk, instead of the classic probability of occurrence. Then we consider potential occurrence of risk inversely proportional to decision reliability. We interpret the reliability intervals according to a qualitative scale to evaluate the potential occurrence of risk which varies from “very high” to “low” as shown in the fourth column of Table 3.

We can see that 31% of the process is caring a considerably high potential occurrence of risk which will impact the process advancement and the firm objectives negatively.

Reliability assessment and diagnosis on decision centers:

This analysis perspective is about to provide the decision maker with a reliability estimation at each decision center of the grid. For that purpose, we provide the decision-maker two useful indicators:

- F_{ij}^{DC} = Estimates the reliability of the decision center for the decision horizon i and Macro process j .
This estimate is provided by the lowest reliability F_k for DA_k among all decision activities of a DC_{ij} .

$$DC_{ij} = \{(DA_{k=1 \text{ to } n}; F_k); F_{DC}\}$$

$$F_{ij}^{DC} = \min_{i=1 \text{ to } 3, j=1 \text{ to } 4} F_{k,i,j}$$

- $N_{ij; F0}$ = Number of decision activities not taken into account by the decision maker within a DC_{ij} .

The results interpretation in this analysis perspective is based on arbitration that takes into account simultaneously both of indicators (F_{ij}^{DC} and $N_{ij; F0}$), and thus prioritizes DC on which decision-maker must act according to the importance of the potential occurrence of risk revealed by the indicators.

Table 4: Reliability and risk diagnosis on DC

Indicators	Meaning of the evaluated reliability	number of DC / total number of DC of the grid	Potential occurrence of risk interpretation	DC titles
$N_{ij, F0} > 0$	DC Holding ignored DA	2/12		-PS1 « Define PSS value creation drivers » -PT3 « Plan organizational changes»
$F_{ij}^{CD} \in] 0 ; 0.3]$	DC with very low reliability	5/12	DC carrying very high potential occurrence of risk	-PT2 « Define the value architecture» -PT5 « Select the profit equation» -PT6 « Establish a level of activity» -PO1 « Plan production and characterize customer interface» -PO3 « Establish an organization for work»
$F_{ij}^{CD} \in] 0.3 ; 0.6]$	DC with low reliability	2/12	DC carrying high potential occurrence of risk	-PS2 «Define the value proposition » -PO2 « Deploy the business model »
$F_{ij}^{CD} \in] 0.6 ; 0.9]$	DC with average reliability	5/12	DC carrying average potential occurrence of risk	-PS1 « Define PSS value creation drivers » -PS3 « Define business processes » -PT1 « Delineate the PSS structure » -PT3 « Define resources» -PT4 « Define the PSS infrastructure»
$F_{ij}^{CD} \in] 0.9 ; 1]$	Reliable DC	0/12	DC carrying very low potential occurrence of risk	0

We proceed to the classification of all DC according to the pre-established reliability intervals and potential risk occurrence interpretations, and also emphasizing the DC with $N_{ij, F0} > 0$. This classification shows that half of DC in the decision-making process accomplished by Ecobel are carrying a significantly high potential occurrence of risk.

DC with $N_{ij, F0} > 0$ are considered as unreliable. We consider these DC as the most prioritized DC for the remediation plan.

From this distribution, we proceed to prioritize the DC to deal with (in descending order of potential occurrence of risk), and then to detail the analysis of each DC in terms of DA. Then we can draw three kinds of general conclusions / remediation according to the predefined reliability intervals for DC and to the importance given to each DA:

- First, for unreliable DC, which include ignored DA, remediation would be turned to awareness raising and training effort for the decision maker for the ignored issues. This may have significant impact on the long-term performance of the firm.
- Then, for unreliable and very unreliable DC, they show that DA were actually treated, but decision maker referred often to an intuitive decision-making process strongly influenced by the initial organizational model.

Then, in order to improve the reliability of these DA, remediation would demand efforts of analysis, anticipation and especially of changing dominant decision models in the business.

- Finally, for DC with average reliability, they show that their belonging DA have been processed and analyzed, but the problem lies in the lack of resources to carry out these decisions. The remediation effort will be directed more towards an allocation of resources in terms of competencies and investment to provide additional information necessary for these decisions.

It's also important to consider the positioning of the prioritized DC on the grid. Actions plans should take into account the concerned decision horizon and MP in order to keep a global consistency of the process.

5 CONCLUSION

The purpose of this study is to introduce a diagnosis approach for servitization process planning, which is based on risk occurrence anticipation. The diagnosis allows highlighting weaknesses of decision areas in the accomplished decision process. We consider these weaknesses as carrying a potential occurrence of risk. The main perspective of the study is to establish a global model that considers simultaneously potential risk occurrence and risk impacts, in order to prioritize the decision centers to deal with for the decision maker. This would facilitate controlling the servitization transition, and limiting time and effort losses. We recognize the limits of the study focusing only on the reliability of the decision process, the intuitive side of the decision making process is not taken into account in this work.

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GAMIFICATION FOR SERVITIZATION

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ABSTRACT

The study described in this paper has set out to explore gamification from a servitization perspective to understand the opportunities and research challenges. A systematic literature review has been conducted to capture key characteristics of differing forms of gamification processes in a servitization context. The findings of our study focus on two areas: (1) structural, organization's physical bricks-and-mortar attribute and (2) infrastructural, policies and practices in how structural aspects of servitization are to be managed. Six key findings are presented and collectively these contribute to our understanding of the broader gamification technologies that can help to transform servitization. The contribution of our research is twofold. First it captures a set of theoretical framework for analysing gamification in servitization context. Second, it provides an in-depth roadmap in how gamification can be applied to target major challenges in servitization.

Keywords: Servitization, Gamification, Operations Management

1 INTRODUCTION

The Gaming industry is thriving. Gamers around the world are paying to have access to games for completing virtual tasks, purchasing virtual goods and gaining virtual capabilities. Developed on the fringes of contemporary gaming culture, applying gamification to the business world has gained increasing traction in a wide range of fields from education, marketing, computer programming to defence industry.

Gamification offers much potential to servitization. Gamification is a new business phenomenon, taking sophisticated game mechanics and applying those elements into a non-game context. Managers can apply gamification to engage and align user communities with their own needs by offering rewards and support tools that channel positive user innovations (Edery and Mollick, 2008).

The opportunities through gamification have yet to be fully realized. Despite hundreds of millions of gamers interacting with games on their commutes and at home, games remain an untapped opportunity for many businesses.

The purpose of this paper is to explore gamification from an servitization perspective to understand the opportunities and research challenges. We review the literature of gamification in an advanced service context, and through this present a framework that captures key characteristics of differing forms of gamification processes. Through this research, we have prepared a foundation that future research can use to expand the understanding of how gamification is applied in servitization.

2 Background

People have been applying games for a very long time without fully realising the full scope and diversity of the concept. The ancient Roman empire introduced gladiatorial combat to inspire admiration of Rome's martial ethics and relieve aggression of ancient Romans (Shelton, 2013). During the Warring State Period of ancient China, Sun Bin an alleged decedent of Sun Tzu was using horse racing to teach military strategies to Chinese aristocracy at that time. Modern day professional sports coach use game concepts to motivate their players to carry out long hours of repetitive physically demanding practice in order to produce flawless techniques.

According to Werbach and Hunter (2012) the first use of gamifying online systems was as early as 1980 by Richard Bartle, a pioneer in multiplayer online games, who referred to gamification as "turning something not a game into a game". As an extension to capture the complexity of gamification, Werbach and Hunter (2012) define gamification as "The use of game elements and game-design techniques in non-game contexts".

Gamification design with clear rule, goals and immediate performance feedback describe both the reasons for which the player interacts and the method by which the player can solve problems in the game (Uren and Brewster, 2013). These game mechanics can enrich the 'flow' experience, which is a psychological space in which the player can be immersed in the present moment, without any distraction from the past and future (Mainemelis, 2001).

Clear goals are created through alignment of the player's capability and the level of interaction between the player and the game goals (Deci and Ryan, 2004). When one's skills are much greater than the level of the game, boredom and lack of motivation arise, and when the goal is too difficult, anxiety and frustration will inhibit engagement (Mainemelis, 2001).

Immediate performance feedback allows engagement of the activity for a longer period of time (Mainemelis, 2001). Gamification creates immediate performance feedback to the player through providing interactive information concerning the player's performance and indicates what goals have yet to be completed, which is often used in the form of a 'quest log' as is the case with massive multiplayer online role playing games (MMORG).

People seek out the flow experience in all walks of life, often without realizing it. This can range from people going into a coffee house to inspire creative work, to a professional sports players practicing purposefully in order to win a high tension game. The absorptive capacity of human brains, together with emotions, can react differently to a variety of information presented to them. Gamification creates the flow experience through digital media technologies with advanced support in the form of audio and imaging, allowing reduced anxiety and fun elements enabling a transition into a fully engaging experience (Mainemelis, 2001).

Gamification design relies heavily on human psychology theory and advanced information technologies. Managers can assemble gamification components flexibly in order to drive people's innate motivation and create conditions for a fully immersive 'flow' experience that can lead to many forms of operational benefits. The convergence of gamification with new technologies can drive change among industry, research and institutions to form new organisational structures in order to maximize their gains from these new technologies.

3 METHOD

Gamification in operations management is being addressed by multiple research communities involving business management, computing, human psychology and many others. This systematic review seeks to map out diversity of intellectual domains both within and across these. The aim of this research is to provide a holistic and organizing lens for viewing the various knowledge contributions from multiple research communities addressing the leading thinking with gamification for operations management. To achieve this, our study has set out to address the following questions:

1. Where it has been applied?
2. What has been impact?
3. What are the opportunities?

Our research adopted the existing frameworks, such as those provided Baines and Lightfoot (2013a) are carefully targeted at particular aspects of operations management, to give a comprehensive method of assessing where gamification has been applied.

To address these questions we have followed the principles and process of systematic review methodology. Systematic review methodology provides a viable means to management research to synthesize and organize research findings from multiple studies.

4 POSITION AND IMPACT OF GAMIFICATION IN ADVANCED SERVICES

Our research design adopt advanced services framework in structural and infrastructural decision categories (Baines and Lightfoot, 2013a) to identify where gamification is being used against each category.

4.1 Gamification and Information Technology

In the industrial age, technology development and innovations are mostly top down, beginning with the use of professionals in government and business, then moving on to mass consumer markets. In today's world, technologies are often being developed for personal use first then move back to business and government (Shelton, 2013). This trend has shifted the competitive nature in many manufacturing business, from gaining cost advantage by offering product with efficient materials, designs, and manufacturing processes to higher level customer services with focus on total experience, which is driven by data embedded within product and services (Shelton, 2013).

Manufacturers express increased interests to transform themselves into advanced services, this has led changes to process and information technologies to be built around service delivery with focus on providing the manufacturer with visibility of their product as it is used by the customer (Baines and Lightfoot, 2013).

Operators incorrectly use machineries can result frequent service calls, companies can use advanced ICT technologies to capture information about the way in which the product is used and then use this to modify desired behaviour. Gamification is a powerful tool to accelerate and drive behavioural change, virtual currencies and leader board can be designed to trigger intrinsic drive and extrinsic rewards for responsible equipment use behaviour and immediate performance feedback allows early warning for any misconduct.

Gamification design can be realistic or fantasy (Lameras et al., 2013) to help advanced service operations to create better understanding of its customer needs and wants. Managers often find low employee awareness and inconsistent interpretation of customer requirements that inhibit their ability for a better interface with their customers. Gamification is used to facilitate better understanding of customer production processes (Laine, 2012). The game requires competing teams to seek optimal production processes as to how equipment provided by the company is used. According to Laine (2012) the key purpose of the game is to encourage participation to actively think about how they can help the customer do business more profitably, over the life time of the equipment in use.

The use of gamification with 3D virtual reality allows real time, media-rich and highly interactive collaboration between manufacturers and their customers (Kohler et al., 2009). For example, sales in the pharmaceutical industry are a unique process, salespeople must respond to the varying needs of different doctors to persuade them to adopt the practice of prescribing certain medications. Gamification in 3D virtual reality allows salespeople to practice their response in a variety of situations in virtual pharmaceutical sales (DesigningDigitally, 2012).

4.2 Gamification and Processes

Organizations often misbelieve if they invest in latest information technologies from off the shelf ERP systems, hire most expensive consultancy boutiques, and build up best in class manufacturing process technologies, they could drive product into market like speed of light. In reality, and their feet are constantly on the breaks. Introduce radical new product into market can potential make their existing process manufacturing technologies obsolete (Baines and Lightfoot, 2013b). Also, many high value

manufacturing and service industries, new products cannot be commercialized without breakthroughs in process technology (Christensen and Raynor, 2003).

The true value of information and process technologies are not just their physical aspect, the key ingredients in their recipe, are the intellectual capital embedded within them. Gamification can be an effective tool for enhancing learning and understanding of complex subject matter (Garris et al., 2002), it has the capability to bridge knowledge transfer of tacit and imitative manufacturing process know-how that reside in the heads of the scientists and engineers.

Different people are uniquely predisposed to different learning styles. This is because individuals have different ways of perceiving reality. People have constantly searched for ways to escape into a virtual world and current technology is an extension of this. Sometimes, safety and cost reasons can prohibit test and learning to be carried out in the real world, such as navigating a newly designed passenger airplane. Gamification offers cost efficient alternatives to teach employees essential information about the testing/ training context in virtual environment, allowing people to interact with the object, assess their performance and receive feedback to identify area of improvement (Shi et al., 2013).

In new product and processing development, testing is required to ensure that new products / services or its prototype function properly before it is commercialized. Gamification allows companies to test and learn in virtual reality before commit themselves before building physical prototype. Gamification can be designed to introduce lower fidelity virtual goods that would take years to develop and costly to produce into the real world, hand out copies to other users, analyse users' reaction to the prototype, and gain valuable insights for modifications (Kohler et al., 2009).

4.3 Gamification and Supply Chain

Managers with responsibility for hundreds of product co-development programmes must assure critical technological intellectual properties are protected, which requires sophisticated coordination skills between new product design and manufacturing processes (Shi et al., 2012). Extensive outsourcing could endanger skills loss in project management and knowledge transfer that are common in vertical oriented organization (Hayes, 2005).

Gamification can make arguments about how business systems work and make claims about the world through procedural rhetoric (Bogost, 2008), which is the practice of effective persuasion and expression using processes. The player can interpret these processes and interpret the argument in their lives. For example, a flight simulator program attempts to model how the mechanical and professional procedure to aviation works. Unlike productivity software such as word processors and spread sheets, gamification creates an interactive virtual model allow players to explore through play (Bogost, 2008).

Real life businesses involve unintended consequences and complex interrelationships. Gamification can teach managers learn systems thinking, with a shift away from the "learning by listening" to "learning by doing" (Garris et al., 2002). Managers can make system decisions like a chess master, each move requires whole system thinking to attack or protect around strategic patterns, rather than tactical move on each individual piece. Gamification can simulate uncertainties of complex business interrelationships such as protection of intellectual property, process technology, R&D, and learning in an interactive virtual environment. This allows operations managers to learn any unintended consequences before making vertical integration or outsourcing decisions.

4.4 Gamification and Project Management

Production operations traditionally focused on functional planning and control, by specialized group of expert within their own functional field, as result, solutions are mostly predictive and potentially conflicting with other functional goals. In product centric servitized operations planning and control systems encompass physical assets, maintenance and service processing, management tend to be structured in a joint manner between delivery arm and commercial arm and customer service groups (Baines and Lightfoot, 2013a). Generating solutions for delivering product availability and functional capability requires a rich mix of people contribute to the project ideas, involving cross functional groups within the company, suppliers, customers and even competitors (Hayes, 2005).

Project managers can use gamification to enable team collaboration, where complex technical issues can be solved by specialists in seemingly unrelated fields. Companies can take advantage of gamification by bring together large groups of bright people outside the walls of a company (Jeppesen, 2005). For example, the Foldit game helped to develop treatment for disease through capitalizing on people's spatial awareness and problem solving skills. Foldit uses games to represent complex protein structures. Differently configured protein might prove effective at neutralizing the HIV virus and the game goal is to score the greatest number of points by identifying the optimal shape of a protein (Baker, 2006).

4.5 Gamification and Productivity

Good managers inspire their employees to work extremely focused and productive, and in an ideal situation, work should be fun and engaging. The cost of disengagement can be enormous. In the United States disengagement cost was estimated about \$300 billion a year in lost productivity (Pink, 2010). Often manager merely focus on extrinsic financial compensation such as short term incentive plans and pay for performance schemes with less attention on intrinsic motivation such as rewards of recognition or the satisfaction of having made a positive contribution (Shelton, 2013). Intrinsic motivations are difficult to address because individual perceptions and their motivations are more complex and managers often lack effective tools to engage with individual employees.

By introducing game mechanics, gamification can encourage collaboration, encourage information sharing, reward contribution and improve employee morale where monetary incentive may not be necessary. When people are intrinsically motivated, they engage in the activity for inherent satisfaction, rather than to gain some outcome separated from the activity (Mainemelis, 2001). Workforces perform best when they are fully engaged. Time seems irrelevant to the activity and the energy of each individual is focused on present tasks with past and future issues not disturbing their status of mind.

4.6 Gamification and Knowledge Management

Increasing complexity of customer needs drive companies to adapt to satisfy varying customer needs. Cultural change requires right performance measures. In the old world communication was expensive, organizational structures were more likely to be hierarchical, where information seekers navigated around information hoarders to get data and knowledge they seek (Shelton, 2013), operations is generally measured against cost, specification and delivery on time (Baines and Lightfoot, 2013a). In contrast in the new world, where communication cost is near zero, a networked organization is formed to share information and knowledge with everyone (Shelton, 2013).

Gamification can help to develop a knowledge sharing culture. Use new information technologies that can move company culture away from core values of developing and hoarding valuable proprietary information, to sharing that information for the benefit of the entire industry (DesigningDigitally, 2012). Managers can use gamification to create fun and energizing workplace, goals and incentives that channel intrinsic motivation of each creative individual to develop desired skill set, involving relationship building, flexible, service centric, authentic, technically adept and resilient (Baines and Lightfoot, 2013).

5 CONCLUSION

Our research indicates that the gamification can be applied with confidence to servitization. Total six areas of advanced services can benefit from gamification, involving, ICT technologies, processes, supply chains, project management, productivity and knowledge management.

Although much progress in gamification design, technologies and applications has been made in the recent years, gamification application in the servitization context is still in an exploratory stage. In contrast to the uptake of technology and management techniques in last century, the internet age, a rising population with high tech literacy and open sources on multiple technology platforms will increase the adoption of gamification at rapid pace. Gamification design can create interactive,

challenging, engaging and media rich environment to help many manufacturing and service operations.

However, to deliver gamification and gain acceptance in corporate world are challenging, many organizations may have low tolerance for radical technologies, managers may lack of experience and awareness to implement gamification technologies, game design can be difficult to both engaging and educational.

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GAMIFICATION: USING GAMING MECHANICS TO PROMOTE A BUSINESS

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ABSTRACT

The use of digital games and gamification has demonstrable potential to improve many aspects of how businesses provide training to staff, operate, and communicate with consumers. However, a need still exists for the benefits and potential of adopting games and gamification be effectively communicated to decision-makers across sectors. This article provides a structured review of existing literature on the use of games in the business sector, seeking to consolidate findings to address research questions regarding their perception, proven efficacy, and identify key areas for future work. The findings consolidate evidence showing serious games can have a positive and valuable impact in multiple areas of a business, including training, decision-support, and consumer outreach. They also highlight the challenges and pitfalls of applying serious games and gamification principles within a business context, and discuss the implications of development and evaluation methodologies on the success of a game-based solution.

1 INTRODUCTION

Modern businesses are frequently faced with challenges such as rapidly evolving marketplaces, shifting labour markets, and the need to reach consumers who are increasingly engaging with a wide range of digital media, both in the workplace and during their leisure time. Addressing these challenges requires a wide range of skills from both senior and front-line staff, in-turn requiring innovative and effective training tools to aid staff at all levels of an organisation as they adapt in response to emerging challenges. This article considers the specific case of the application of digital games for serious purposes ("serious games"), and using game elements to enhance existing services, training programmes, and products ("gamification") with respect to the benefits they offer to businesses, both when adopted as additions or alternatives to existing training or decision-support systems, and as a means to reach consumers.

Underlying this review is an identified need to communicate the benefits of the use of gamification to address a wide range of perceptions of games and gaming across sectors, organisations, and individuals. Whilst academic evidence demonstrates the benefits of the use of games/gamification to address problems across a wide range of contexts, developers of serious games and gamification often face a challenge in presenting a compelling business case for their use, particularly as game elements may superficially appear unrelated to targeted objectives, or less likely

to offer return on investment when compared to a lower-cost solution. This perception is rapidly changing, in part due to the success of a wide range of games deployed in business contexts, and also due to the emergence of development tools and game engines which increasingly allow immersive, engaging, and visual content to be created with significantly lower production costs.

As highlighted by this article, many businesses have already noted the impact of games in these sectors, and explored their use. In the next section the authors are presenting the definition of gamification. Section 3 focuses on the benefits of gamification for the business sector, section 4 focusses on the inhibitors to successful exploitation of Gamification and section 5 concludes the paper.

2 BACKGROUND

Gamification is defined as the process of using game thinking and game mechanics to solve problems and engage players. (Horizon Report, 2013). It essentially describes the integration of game dynamics, service, community, content or campaign in order to drive participation to all manner of productive activities. The basic difference between actual games and gamification is that the former is an actual *product* that is consisted of gamified activities whilst the latter entails a *process* that may exist within or without the necessity of a game and its subsequent environment.

Today the use of game elements, design and mechanics is incorporated in many aspects of our lives such as education, work, entertainment, communication and exercise. Many researchers have studied the benefits of participating in games in peoples' lives. For example, Jane McGonigal [1] mentions numerous aspects that can be promoted through games. Some examples are: motivation, competitiveness, collaboration, creativity, enjoyment, engagement, satisfaction and innovation. Many researchers (i.e. [2],[3-7]) support her claims and provide evidence that games have the capability of satisfying a range of needs found in [8] hierarchy of needs (e.g., creativity, problem solving, morality, spontaneity, self-esteem, confidence, achievement, respect of others, respect by others, friendship, family).

Gamification offers the introduction of competitive elements. Such elements are typically unexplored or avoided in more conventional pedagogy, for example Goodman suggested competition in a conventional educational setting leads to anxiety and reduced learning enjoyment. Gamification often seeks to add value or additional challenge to mundane activities: success requires either genuine perception of this value, or utilizing the increased challenge to create a "flow" experience that engages the player. Simply adding points to tasks without having a strategy for giving them value is unlikely to lead to meaningful behavioral change or learning outcomes, rather, these points need to be given value either in terms of tangible reward, or capitalize on social elements to stimulate collaboration and/or competition.

The table below gives examples of successful introduction of gamification in business context.

Serious Games	Description	Paper
Houthoff Buruma.	The Game: serious game for recruitment purposes, developed by Dutch law firm Houthoff Buruma	
Novicraft_	NoviCraft is a serious game developed by Microsoft for supporting business customers in social excellence, in learning to construct shared understanding together with different people in changing contexts.	http://www.ludocraft.com/pellaaja/pdf.pdf
ALM: Change Adaptation Learning Model	Serious game for testing, validating, and refining plans to enable transformational organizational change. Developed by DecisionPath,	R.M. Adler and D. Koehn, "CALM: Complex Adaptive System (CAS)-Based Decision Support for Enabling Organizational Change", Intl Conference on Complex

		Systems (ICCS 2007), Oct 28- Nov 1, 2007
Addo Agnitio Award (A ³)	Accenture - a technology, outsourcing and management consulting company - started a gamification programme aiming to promote the communication and collaboration of more than 250,000 personnel around the world employed by the company. The programme was named Addo Agnitio Award(A ³) and used a rewarding system to achieve its objectives.	Leeson, C. (2013) 'Driving KM Behaviors and Adoption through Gamification'. <i>KM World</i> 22 (4), 10-20
Seattle-based Slalom Consulting Game	Seattle game consulting created a mobile phone app game in order to increase the communication between employees. The Game was played by almost 1800 (over 90% participation) employees of the company. The game included a leaderboards and achievements system	Korolov, M. (2012) 'Enterprise'. <i>Network World</i> 29 (15), 30-36
Going Social	Bunchball Bluewold uses gamification tools in order to increase the social interaction between their employees. The Going Social allows the employees to earn points for building and maintaining their profile, sharing Bluewolf content into social media sites such as Facebook, twitter, LinkedIn and posting on internal boards.	Bannan, K. J. (2012) 'Bluewolf Uses Employee Gamification to Increase Social Sharing'. <i>B to B</i> 97 (6), 11
Nike+	Nike build a system that allows it customer base to track, share and compare exercise results while they earn achievements points. Currently 11 million people are using their system	http://itechthereforeiam.com/2013/08/gamificati-on-to-nike-starbucks-us-army-and-yes-emc/
U.S Army	U.S army is currently using serious games in order to train their forces and improve their recruitment. Through the creation of the America's Army Game, they have improved their recruitment process. Currently 11 million people are playing their game.	Wray, R., J.E. Laird, A. Nuxoll, D. Stokes, and A. Kerfoot,... San Jose, CA.
Starbucks Mobile app	Starbucks Mobile app rewards their loyalty customers through the usage of an achievement system. Every time their customer completes an achievement they have receive special offers from the company. Currently over 6 millions customers are using their app.	http://itechthereforeiam.com/2013/08/gamificati-on-to-nike-starbucks-us-army-and-yes-emc/

3 BENEFITS OF GAMIFICATION

Reeves and Read [9] argue that gamification can help in increasing productivity and job satisfaction by transforming serious work into exciting, engaging and entertaining play. They also believe that gamification can deliver benefits to the individuals who interact with the business and the business itself, by aligning the individuals' interests with the organisational goals. They argue that games have already influenced work, advertising, news and political communication, and that the latest games should be seriously considered and used in reengineering the entire Human-Computer Interface.

Matt Davis, director of innovation for the Filene Research Institute, realised what gamification can offer to the sector of financial services and stated [10]:

"The goal of gamification is to use the dynamics and mechanics associated with games and apply them to real-world experiences...if misaligned incentives, boring experiences, and unmotivated audiences are the enemy of traditional financial services, gamification could be our hero." Some of the characteristics of games combined with the playful nature of the human species allowed games to become a great part of our lives and progressively invade the industry.

Csikszentmihalyi [11] suggests that rewards of conventional sort are not the only motivations for the human behaviour. By studying people who dedicate a lot of time and energy on activities offering minimal conventional rewards, Csikszentmihalyi (1975) wanted to find a different form of motivation and better understand the human behaviour. During his study he recognised the importance of "flow" in keeping someone interested and engaged in a task. Amy et al [12], believes that flow is an important feature of games that helps in shaping someone's behaviour.

Another common characteristic of games is competition, which has been a part of human life since the beginning. Based on Darwin's theory of natural selection, all species, humans included, have always been competing against each other for vital (e.g., food, water, land) or scarce resources in order to survive. Therefore, McDonald, Musson and Smith [13] argued that by having people to compete against each other within a game stimulates the survival instincts that are found in everyone.

Montola et al [14], believes that a practical way of overcoming challenges is play, as activities with no external goals can become pleasant with challenge stimulations, while goal oriented activities become unpleasant with challenge stimulations. Reimer states that many activities are already inherently game-like, and gamification can involve fostering the recognition of this, rather than explicitly attempting to modify the activity [15]. The simple notion of gaming can stimulate interest in certain audiences [16], and it could be argued, based on the author's own subjective experience, that simply referencing pop-culture shows built around teamworking such as *The Apprentice* can have a dramatic impact on students' enthusiasm and attitude in approaching team-based activities.

Rewarding systems, which are part of game mechanics, are also a common feature of games and play a central role. Reeves and Read [9], support that by using rewards that are directly connected and core to the employees tasks and removing the responsibility and control from supervisors, can lead to the decentralisation of a business and allow personnel emphasise their efforts according to their interests. Furthermore, these loose hierarchies will force people to adjust and develop self-organising behaviours that are ideal for them, and therefore, more efficient. These changes can create a democratic environment, where employees will be able to select and execute task that better fit their aims and ambitions. Additionally, well-designed rewarding systems can become a permanent reminder of peoples' contributions to every task. They can also empower the spontaneous formations of teams and alliances between people from anywhere in the business that share common interests and have the same excitement and internal motivation in completing a specific task.

4 INHIBITORS TO SUCCESSFUL EXPLOITATION OF GAMIFICATION

Forecasts show that growth of gamification within the business world will increase exponentially in the following few years. According to Gartner, by 2014 the percentage of Global 2000 organisation that will have at least one gamified application will surpass 70 [17], and by 2015 25 percent of redesigned processes will incorporate some form of gamification. M2 Research estimates that the gamification marker will grow to more than US\$2.8 billion by 2016, from US\$100 million in fall 2012 (Korolov, 2012).

Nevertheless, Gartner estimates that, by 2014, 80% of gamification attempts will fail as a result of poor design. It is, therefore, essential to raise awareness around the limitations, pitfalls and barriers of the gamification process for both the enthusiasts and sceptics who would like to cautiously make their first steps towards gamifying parts of their organisations. Game-based approaches are not universally welcomed, and in this case could be perceived as making a resource less valued as a learning resource. The "strictness" of game rules and level of difficulty are also noted as challenging to effect without leading to usability issues. Given the recognised importance of usefulness and ease-of-use in technology acceptance [18], these findings suggest gamification must be carefully and selectively applied to avoid a negative outcome. This could be achieved by adaptivity on an individual level, for example giving users the choice between the initial resource and its gamified form, though this assumes users would be able to introspectively select the ideal resource for their learning needs, a

theory partly contradicted by a number of studies [19, 20]. A more comprehensive solution, therefore, should seek to understand the learner more fully and provide them with the optimum resource based on this understanding, a task which is the subject of continued research [21]

Korolov [22] mentions a number of mistakes or omissions that could lead a gamification initiative to failure. According to the author, using the wrong rewards or replacing reasonable compensation with virtual rewards can be reasons for failure. Letting a game to become stale is another reason. Following the example of video game companies, businesses should keep updating their games, release expansion packs and develop new games in order to maintain their employees' interest and engagement; and target new organisational objectives.

Leeson (2013) and Korolov (2012) argue that taking a simplistic approach and ignoring the importance of game design and behavioural economics can lead to failure. Games must be meaningful to the employees, and points, badges and leader boards are not enough to accommodate the desirable longstanding outcomes.

Montola et. al. [14] and Burke and Hiltbrand [23] call for caution when integrating achievement systems. Even though there are examples with successful utilisation, they bear some yet unrevealed traps due to their youth in the context of gamification. In the case of *Nokia Image Space*, a geo-tagged photo sharing service, achievements did not have a main role. Nevertheless, they aided the participants to navigate and learn the different features of the system's prototype, and stimulated some friendly competition between the users [23]. However, along with the positive effects, the achievement systems triggered undesirable usage patterns leaving the users unconvinced and concerned.

Montola et. al [14] believes that for an achievement system to work, it is important that the users already like and appreciate what they are doing and they just need something further. In such cases, providing loyal users with status symbols connected with something they value brings better results. However, if those achievements gain a negative connotation (e.g., wasting time, non-productive, just entertainment), the opposite results can occur with the users stop using the system, information getting ignored [23] and productivity declining. Another result of using a poorly designed achievement systems is the confusion about progress they can be caused amongst users. Based on [23]experience, immediate and explicit feedback is critical in order to avoid such confusion. They highlight that the users have to be "notified immediate when they gain an achievement, to remind them of the existence of the achievements, to reward them on the spot, and to arouse their curiosity towards achievements."

One of the greatest barriers when implementing gamification is the culture within the organisation and the way serious work is seen by the management. The use of words or phrases that include the word "game", like "*Serious Games*" or "*Gamification*", are a headache for the members of management who believe that work should be grim and unpleasant and not enjoyable in order to be serious. James Gardner, chief strategy officer at Spigit, recommends the use of the phrase "psychological dynamics" when talking to the management team (Korilov, 2012). Leeson [17] provides some guidelines and draws attention to areas that require greater consideration throughout the gamification programme. Having the programme's objectives always in mind during design, development and implementation is one of the key success factors. Focusing on the behaviours the employees must embrace and not the activities indicating those behaviours is another. If the opposite happens, staff members will end up doing things that are not necessary and are not helping towards achieving the programme's objectives.

Making the system available to as many employees as possible, and consequently, recognising and rewarding the efforts of as many staff members as possible can also assist in its success. However, being aware that the possibilities of having people taking advantage of the system, cheating and using it in a way that is was not intended increase is important [17]. Even though the supporters of gamification can list numerous positive effects of serious games in the business world, they still acknowledged that it is not panacea and can bring negative or even the opposite of the intended effects if not used carefully. Although it is not a trend and it is here to stay, it is not a silver bullet for all the problems in the industry [17]. Being able to capture, store, retrieve and correctly interpret data is also very important [17], especially in cases where people's efforts need to be recognised and rewarded, and where the systems are used for monitoring and presenting progress and performance, and providing feedback.

Burke and Hiltbrand (2011), warn that once gamification in applied and users are accustomed to perform learned behaviours only when participating in the game, those behaviours can be lost when play stops. Therefore, it is suggested that play continues in order to motivate users perform those behaviours.

5 CONCLUSION

This article has presented the benefits and limitations of gamification for business context. The findings, highlighted in their relevant sections, show demonstrable benefits from using game-based approaches in a diverse range of application areas, ranging from training to customer engagement. Whilst these benefits in turn have contributed to increased uptake of game-based approaches, serious game developers need to be aware of the need for solutions to provide demonstrable return on investment and solutions to business needs. The increasing evidence base is already challenging perceptions that work cannot be "fun", and the use of games and gamification principles has demonstrable potential to improve the efficacy of training programmes, increase productivity, and even reach out to a global community of volunteers willing to contribute their time to gamified problem-solving.

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BROADER ASPECTS OF SERVITIZATION

EDUCATION AS A SERVICE (EAAS) FOR ORGANIZATIONS

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ABSTRACT

The education is a necessity for each organization in commercial or public environment. The fast development of new services requires a regular training of the service provider staff those who involved in sales as well as in operations. And recent catalogs include large spectrum of training services related to hard as well as soft skills. However, the increase in demand for training naturally has an impact on the budgets of each organization. This situation is not acceptable on a long range. For this reason the efficient solutions, how to train employees faster and cheaper, are needed. On the other hand, rapid development of Information and Communication Technologies increases pressure on the computerization of education as the main educational method. Furthermore, the problem in providing such services for organizations is that almost solutions are incomplete. The EaaS suppliers provide the hardware, software licenses or training as software packages independently. Moreover, customers are forced to buy these products and maintain them on the regular basis. Those vendors are offering technology including internal solutions with low level of flexibility. On contrary, we propose in our paper innovative approach that provides a high level of autonomy for users, flexibility in management, and build space for creativity in the future. This approach is based on the cloud concept, where the process of education was adapted for cloud environment to reduce investment and operation costs of an organization. This type of services have form E2E. And the training is delivered in the form of services where customer pays only for content and testing of employees. All technologies as well as development of training is in responsibility of supplier of services.

KEY WORDS: Education, Cloud services, LMS (Learn Management System), eLearning, Face-to-Face (F2F), End-to-End (E2E), Information and Communication Technologies (ICT)

1 INTRODUCTION

We live in an environment in which we have learned to buy and use different types of services. These cover a wide range of areas of our life and help us every day in our work or provide support for our daily business. It is quite natural to go to the bakery and buy your favorite bread today, or buy a package of mobile services, which we need to communication with the outside. In both cases we are buying the offered services from the market. The environment we live in today is very different from the past, where organizations were not very specialized. They were supporting several parallel activities they needed to create a final product. This fragmentation of forces had several consequences,

which influenced the quality of products, their cost, level of innovation of product, and therefore the price of the final products. The analyses showed that the specialization of organization makes sense (Baines and Lightfoot 2013a; CIVICT 2009; Hanna 2013, Kryvinska *et al.* 2014). With the changes in the market conditions organizations have started to exclude from their portfolios the activities those are not critical for the business, e.g. not a part of their “core business”. Whereas the separated activities are still needed - organization can buy them in the form of services. This situation supports development of new services (Baines and Lightfoot 2013b; Kryvinska 2012).

In such an evolving environment, we are a part of it; we develop services, which are demanded. At the same time we try to understand and use them. Current market is able to respond to customer demands very flexibly. It is able to expand and upgrade the service catalog by demand for commercial or non-commercial environments (Batista *et al.* 2013). The Figure 1 illustrates the service distribution from a catalog of services to the users (Balco and Greguš 2014).

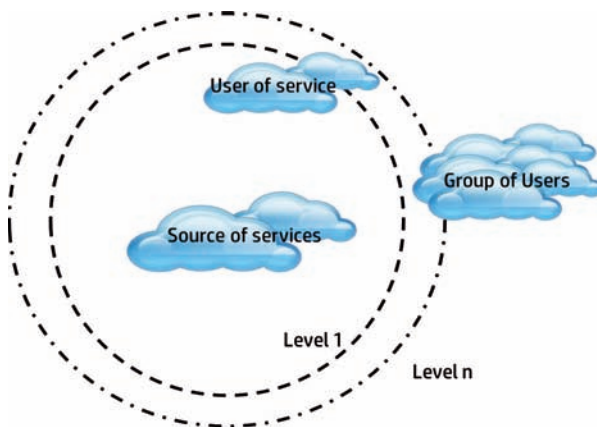


Figure 1: Model of service distribution

Besides the expansion of services, we can observe the evolution of the technologies those facilitate and encourage their development. The ICT is an area that has been undergoing the most intensive development during last several decades as well as the highest level of innovation. Without ICTs support, we cannot imagine the development and the delivery of any new services today. ICT represents the technical support for the development. And it helps to speed up the management decisions (Kak 2004; Kopetzky *et al.* 2013; Kryvinska *et al.* 2014).

2 THE CLOUD CONCEPT, TECHNOLOGICAL SUPORT OF NEW FLEXIBLE SERVICES

The market demand related to service providers is very uncompromising. On the one hand, there are ideas about low prices, while on the other hand, there is a requirement for a differentiation related to the content area as well as add value and flexibility (Balco and Greguš 2014). The deep analysis of information shows that for today's end-user services, there is no matter what technology is used in the delivery of them or the place from which they are provided. The end-user needs to feel the ultimate effects of services, to meet their expectations and needs. In terms of IT architecture, it comes an old-new cloud-based solution to achieve this balance (Polaschek *et al.* 2012; Wan and Clegg 2013).

The history of cloud concept dates back to the last century, e.g. fifties, when it has begun on a large scale in the academic world and intensive companies to use mainframes accessible via thin client/terminal computers, often referred to as “static terminals”, since they were used for communication, and had no internal processing capacity (Strachey 1959). The purpose of this

approach was to share a number of computer terminals, as well as sharing of processor time. In the sixties of the last century, Professor John McCarthy from MIT (Garfinkel 2011) coined a sharing model of computer technology as a way to the sharing of the electricity. It was proposed that households, who have purchased electrical appliances, are not expended owners of the electricity that is not owned by power plant (Strachey 1959).

Old concept of sharing, which has more than sixty years, is used in the creation of new advanced services based on cloud computing. This analogy helps to remove the old dogmatic approaches that each organization must own IT infrastructure, which includes hardware and software products. Approach based on the old principles is very costly and inflexible, in addition accumulates in the IT infrastructure of the organization many funds those return may come into the question many times. Enforcement of such an approach is not obvious, and faces a number of problems often associated with individual as well as the group's interests. These approaches are interpreted solutions based on cloud computing as inappropriate and also risky (Louis *et al.* 2013; Wan and Clegg 2013).

On contrary, characteristics and, therefore, hence benefits of cloud concept can be interpreted as it is shown in the Figure 2. A computing cloud is a set of network-enabled services, providing scalable, QoS guaranteed, normally personalized, inexpensive computing platforms on demand, which could be accessed in a simple and pervasive way (Wang *et al.* 2008). Cloud services are popular because they can reduce the cost and complexity of owning and operating computers and networks. Since cloud users do not have to invest in an IT infrastructure, purchase hardware, or buy software licenses, the benefits are low up-front costs, rapid return on investment, rapid deployment, customization, flexible use, and solutions that can make use of new innovations (Fact Sheet 2011; IDC 2009).



Figure 2: Characteristics of cloud concept

3 THE EDUCATION AS A SERVICE

The education is playing an important role, and it is a necessity for each organization that is moving into the commercial or public environments. An increasing development of new services forms the requirements for the regular training of staff those who offer services - sales staff, as well as those who provide their operation. Modern catalogs include large spectrum of training courses related to the hard as well as soft skills, reflecting customer requirements. The increase in demand for training naturally has an impact on the budget of an organization (Balco 2014; HEA 2009). As this situation is critical, the training departments are looking for the appropriate solutions to satisfy the requirements for training in terms of content as well as the extent. Additionally, it is necessary to ensure that the educational process is economically efficient, which in turn is very crucial since we live in a dynamically changing environment that offers wide range of information. Many of us nowadays feel that we are overloaded with knowledge and information intensity. And therefore, it is necessary to choose the right form of a transition required knowledge to the specific users (Drennan *et al.* 2005). The process of education is a service, through which the required information is transmitted from the

source to the user. The source is influenced by the individual distribution channels. Figure 3 can be considered as a process of the transformation and transition from the source to the users, while they directly affect a source with their needs and requirements (Balco 2014; Shurville *et al.* 2008).

As already mentioned, the education is a service that can be met in different forms throughout its lifecycle. This service is very demanding on resources, including expertise, staffing, technical support and the time dimension. It is an essential one, whether we speak about education of the population, which is the responsibility of the government, or education of employees within the private organization. The intention is always the same, namely to transfer the knowledge, teach a client the skills required to carry out an acquired knowledge and acceptance of feedback from stakeholders. The education is one of the most dynamically developing services that are influenced by the natural environment where they are implemented (i.e., with whom we work, but also with the remote ones those effect on not known) (Balco 2014; Kak 2004; Shurville *et al.* 2008).

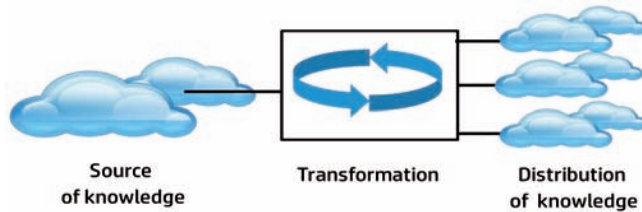


Figure 3: Process of transformation as well as the transition from source to user

The process of an education is in constant motion, thus changing people their rights, knowledge, forms of learning and technical capabilities. It is necessary to find the optimal form for the education and the use of modern technical means that does not reduce training volume. It is appreciated that only educated employee knows and can provide quality services in the market and thus competently represent the organization. A suitable combination of methodologies and technical support can achieve the optimal model for delivery of an education.

In terms of practice, it is necessary also to consider that the future model of an EaaS will consist of the following components, see Figure 4.

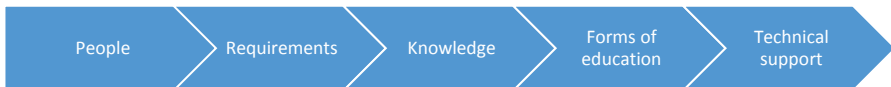


Figure 4: The components of education

3.1 Standard forms of education

For sure, we all remember the learning process that we went through in a school or in the recent past when we passed through the lecturers' knowledge in the F2F (face-to-face) training. They are called standard forms of an education those are very popular but time-consuming and costly. In a dynamically changing environment, they still exist, but the range of financial conditions is affected by the organization. In terms of practice, every organization chooses a suitable model that gives cover requirements, but at the same meets the expectations of those who are educated.

3.2 Electronic forms of education

The theme of the computerization of education has already his history. Many experts argue that computerization is supporting lost personal contact that is essential in transmitting the required knowledge during education. Since that time we have been living in a hectic, standard education

opportunities are limited and therefore need to be implemented the solutions those do not loose continuity.

A disadvantage of the previous period under computerization education was the fact that supplier organizations provided only partial solutions. We identified lack of E2E approach there. Thus, we mean the market operated organizations who delivered only technical solutions (e.g., containing only hardware or software) or those who supplied the content. Additionally, the supplied content was an universal one, and in the case of organizations diversity was a big problem. It was not possible to adapt common knowledge at all. The market simply lacked the organizations that deliver customized packages themselves and built training for staff and students on the basis of stories that pointed to the real examples.

New approach that is observed recently is trying to fill these gaps. The technologies that enable, the market start to offer, the creation of new services eliminate the described above weaknesses (Mell and Grance 2011).

4 SOLUTION – CLOUD CONCEPT IN THE PROCESS OF EDUCATION

The large space for savings in the education can be achieved just by applying appropriate technical support in the widest possible scale. For instance, to get some picture, it is necessary to have an answer for few questions specifying the meaning and essence of education, as follows:

- What is the output of the educational process?
- Is it necessary for an educational organization to invest some/any resources in their own IT equipment?
- Do the educational institutions need to have an IT?

These issues may be considerably more, but after the detailed analysis we come to the conclusion that the educational organizations should be all a source in prior to invest in education. This in turn means that the 'core business' is education, and an IT is just a support for those services.

The cloud solutions are by many organizations presented as something new and innovative. A lot of cases show that those solutions will replace existing internal IT infrastructure and services in the short future. Except for the technical details, there still continues an intensive discussion among experts whether just these solutions are cost-effective and whether the existing economic studies expose enough real advantages of this approach (Balco and Greguš 2014).

The Figure 5 is presenting the high level architecture of Cloud solution adapted for process of education. The reconnection of servers depends on detailed architecture, which is adapted to customer requirements, and in generally it is private ownership of project sponsor. The standard LMS environment in cloud does not include Web cameras and external trainers reconnected through virtual classrooms because of these devices require additional transmission capacity, which in turn has an impact on the price of solutions. The Education as a Service based on cloud architecture is typical flexible education system that integrates a lot of advantages.

The introduction of eLearning using LMS brings in a qualitative change in any organization, and in turn a lot of advantages (Strachey 1959). Courses are delivered as a service on the basis of the agreed SLA (contract between LMS provider and the customers). The environment allows to verify the acquired knowledge through a test to evaluate the quality of training as well as to monitor the effectiveness of training, as follows:

- High flexibility in planning the training,
- Delivery of training is not tied to a specific location,
- LMS environment allows to run eCourses to the third parties, as well as the courses that are formed by an internal staff,
- Delivered solution reduces the cost of the training,
- Portal can serve as HELP environment.

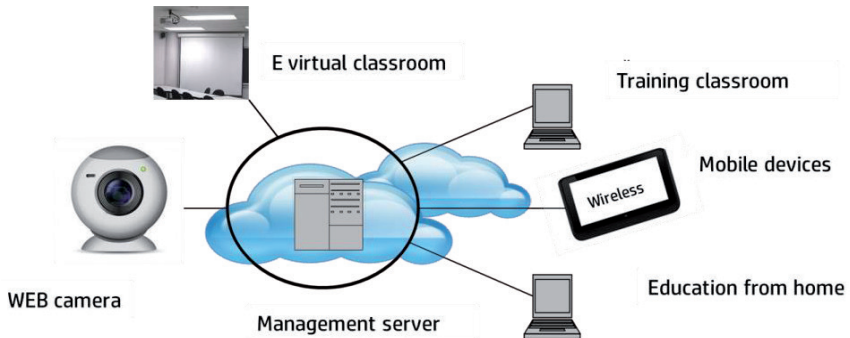


Figure 5: The architecture of EaaS (Education as a Service)

A lecturer in this case is a software application, through which the required knowledge is transferred to an employee. The implementation of eLearning does not mean that all current courses realized through the speaker will be automatically replaced by their electronic versions. Courses that will change the shape will depend on the economic as well as strategic decision. Presented solution allows for the faster transfer of information from executives to ordinary. On the other hand, it allows employees to ask questions through superior communication portal that is a part of the solution.

The EaaS can support a targeted training. And this framework does not consist of only standard courses. Education is a daily process to be encouraged in order to share practical experience that can have a direct impact on the quality and efficiency of services delivered. The deployment of cloud services and solutions has economic impact for each organization. The cloud solution offers a high degree of variability. And therefore, it is necessary to know exactly for which target group the required solution is prosed and optimized. In detail - as follows:

- Add value of cloud solutions in educations - the implementation of innovative services in the case of eLearning based on the cloud environment brings considerable savings to the organizations. These can be interpreted as time savings associated with the preparing and delivery of such solutions. The presented concept is possible to adapt for different range of users including communication with different set of end user devices.
- Education and mobility - presented architecture of the offered solution has a high degree of mobility. The user has an option of connecting via fixed as well as mobile network using relevant terminal' equipment. Moreover, delivered training is optimized for different mobile devices.
- EaaS for business development - proposed solution is an significant help for organizations those who deliver educational services. These organizations do not need to invest in the hardware and software. The EaaS providers can build an environment to serve as a new business in the field of education, certification, making training as well as remote communication.
- E2E model of services - An important parameter of the whole solution is that we can provide E2E services additionally to the LMS environment. And its modification enables the creation and delivery of eCourses, their certification. Solution offers profiles that allow adaptation to individual.

5 CONCLUSION

An implementation of the cloud concept in an education creates business/market space for the wide range of small companies those are able to deliver a lot of new services (Mladenow *et al.* 2012). Thus, the presented concept is a very flexible solution that allows involving many parties (Bhandari *et al.* 2004; Urikova *et al.* 2012). Delivered services can consist of a content interpretation and its modification. On the one hand, the services are predicted for business customers, who use them

mainly for training of their staff; on the other, it provides services for the creation of new courses, design of methodologies and linking through different types of terminals.

In the field of education, there is a lot of information that changes rapidly at the time it is need to be processed and presented in a way that is acceptable to the final customers. It is necessary to vary the scope and content of education for different stakeholders.

From the perspective of the cloud concept regards the optimal solution, where the user gets on the one side environment for creating and archiving the required knowledge and, on the other side, a possibility to transmit the information requested in the form that is used for video, audio, simulations, etc. Besides, the user can work from different type of terminals, fixed or mobile.

From financial point of view it brings to an organization the cost saving. The analysis confirmed that eLearning in organization based on the cloud infrastructure can generate the greatest savings (Balco and Greguš 2014). The actual dimension of savings depends on the size of the organization, scale implementation of eLearning as well as chosen solutions. These savings can be replicated when an organization decides to implement the unlicensed model or on the LMS side. However, this approach is not yet standard as most vendors now prefer just the way of licensed charging and not flat model.

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THE SERVITIZATION OF IT AND EDUCATION THROUGH CLOUD AND MOOCs

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ABSTRACT

Early literature on servitization was focused on the necessity and rationale for the need to create value by adding services to products. This approach regarded services as additional offerings to core (often physical) products. However, recent writings on the subject of servitization recognize that a service can also replace the main product itself. Other approaches to servitization suggest that providing pure services (epitomized in a company's ability to use its knowledge, skills and capabilities) or a combination of physical products and services (where services assume greater importance) is becoming increasingly popular.

New disruptive innovations such as cloud computing and Massive Open Online Courses (MOOCs) add an interesting dimension to the contemporary debate of servitization. In the case of cloud computing, its emergence represents a new paradigm of servitization where a physical product is "morphed" into a service. Furthermore, the ascendance of MOOCs has the potential to servitize education in a manner that is unprecedented in its history.

This paper will explore these two phenomena within the contemporary context of servitization and will highlight the implications of a more servitized Information Technology (IT) and educational world.

KEYWORDS: Servitization, Cloud Computing, Massive Open Online Courses (MOOCs)

1 INTRODUCTION

Cloud computing is increasingly emerging as a new model for servitizing the IT industry. Many organizations, small and large, have embraced this new servitizing model for IT due to the advantages it promises in terms of flexible cost structure, scalability and efficiency. Furthermore, the MOOCs phenomenon is also predicted to do to higher education (HE) education what cloud computing did to IT by providing education as a service (EaaS) that can potentially be consumed on a pay-as-you-go basis (Sultan, 2014). But cloud computing and MOOCs are also disruptive innovation that are likely to require a fundamental and cultural shift in the way organizations (both cloud providers and consumers) view IT and in the way universities and society view education. Both the cloud and MOOCs paradigms represent an approach of providing services (e.g., IT and education) that is different from the traditional delivery of such services. This article will attempt to highlight this issue and reflect on the development of these emerging business and education models and their implications for organizations, universities and society. To describe the cloud computing and MOOCs phenomenon within the context of "servitization" requires some understanding of the history and the literature that gave birth to the concept of servitization. This is important as it will provide some insights into the characteristics that make cloud computing and

MOOCs fundamentally different from other servitized forms of business and educational activity. Furthermore, the disruptive nature of cloud computing and MOOCs requires further investigation of this phenomenon within the context of the theory of disruptive innovation as described by Clayton Christensen and his colleagues. This approach will enable a greater understanding of the behavioural issues that disruptive innovations give rise to and will provide a basis for understanding the cultural implications of cloud computing and MOOCs. Moreover, a good understanding of the cloud and MOOCs phenomena is required. This will be presented in the next few pages.

2 THE SERVITIZATION OF PRODUCTS

The literature on servitization is relatively new and the understanding of the phenomenon is developing quickly (Barnett *et al.*, 2013). The term “servitization” was coined by Vandermerwe and Rada (1988) in the late 1980s and became widely recognized as the process of creating value by adding services to products. They define servitization as “the increased offering of fuller market packages or ‘bundles’ of customer-focused combinations of goods, services, support, self-service and knowledge in order to add value to core product offerings” and claim that manufacturing firms are increasingly moving towards offering services in order to avoid competing on cost alone. This concept suggests that “core products”, often physical products, can be supplemented by adding services to them in order to add value to the main product. For example, some manufacturers such as those that produce Combi gas boilers (e.g., Vaillant, Worcester-Bosch) have provided their customers with annual service contracts. Such contracts are often affordable and can be paid for on a monthly basis and would normally include service, repair and parts. In a country such as Britain, breakdowns of such appliances can be very expensive to repair and finding reliable and qualified plumbers is a problem and often the focus of many TV programmes aimed at targeting rogue workmen. The servitization of products is therefore a strategy of creating value by adding services to products (Baines *et al.*, 2009). More recent writings on the subject of servitization recognize that a service can also replace a main product in itself. Indeed, according to Vargo and Lusch (2008), over the last several decades, a number of leading-edge firms, as well as many business scholars and consultants, have advocated the need for refocusing a great deal of firm activity through transforming the entire firm orientation from producing output, primarily manufactured goods, to a concern with service(s).

The common justification, according to these authors, is that these initiatives are analogous with the shift from a manufacturing to a service economy in developed countries, if not globally. According to Vargo and Lusch (2008) there are two types of output that can be produced by firms: (1) tangible (physical goods) and intangible units of output (services) and (2) intangible output (services produced in their own right) that has no reference to a physical product. They refer to the former concept as the goods-dominant (G-D) logic and the latter as the service-dominant (S-D) logic. The notion of dominant logic refers to the shared mental maps which groups of managers use and develop as part of their core business operations. This is often represented through a common mindset or shared perception of how a business works and the accepted tools and approaches which are in use by the ‘dominant coalition’, or senior management team, when making decisions (see Ng *et al.*, 2012).

The most “critical distinction” between the two logics, according to Vargo and Lusch, is found in the conceptualization of “services”. In S-D logic service is defined as the application of competences (knowledge and skills) for the benefit of “another party” (i.e., partner or customer). Vargo and Lusch (2008) grounded their definition of services (as the main business activity) mainly in the activity of marketing. It was B2B (business-to-business) marketing, according to these authors, that recognized the need to develop collaborations and partnerships with customers and also recognized that these customers were not buying output, but rather the service capabilities of that output. Ahmed *et al.* (2013) provide a useful example of an S-D logic epitomized in the case of International Business Machines (IBM). Faced with many challenges during the 1980s and 1990s (e.g., inability to crack the personal computer (PC) business, the impact of the PC on its mainframe computers, crashing stock price, loss of revenue) the company, thanks to the efforts and vision of its new CEO (Louis Gerstner) at that time, managed to overcome many of its problems. For example, it was able to move up in the value chain from production of hardware and reinvented itself as provider of “business solutions”. These solutions were drawn from an industry-leading portfolio of consulting, delivery and implementation services, enterprise software, systems and financing (Ahmed *et al.*, 2013). Solutions,

according to these authors, are customer-focused and are provided not merely by a good and some added-on services but by means of packages that include both goods and services.

The aforementioned definitions of servitization suggest that providing pure services (epitomized in a company's ability to use its knowledge, skills and capabilities) or a combination of physical products and services (where services assume greater importance) is a new business model for generating income and also for providing value (or better service) for their customers. In either case, the notion of establishing a close relationship with the customer assumes great importance in the delivery of a service. Interestingly, the emergence of cloud computing represents a new paradigm of servitization; where a physical product is "morphed" into a service. Understandably, the S-D logic concept is different from the service model that was created by cloud computing. The S-D logic does not see service (or services) as an alternative (to goods) form of product. Furthermore, S-D logic defines service as being a source of benefit that is "co-created" with the consumer rather than embedded in the output and that the consumer-orientation is redundant (see Vargo and Lusch, 2006). It is, therefore, difficult to see how the S-D logic can be applied to the cloud model or MOOCs models. In fact, the S-D logic came under some criticism for being relevant only to managerial activities, e.g., marketing (Ibid.). Even Vargo (2011) acknowledges some of that criticism and refers to the S-D logic as a "pre-theoretic" lens or perspective for viewing the economic and social world differently from the traditional microeconomic view. IT companies that traditionally sold (and physically delivered) complete software and hardware products can now, thanks to the cloud business model, do so remotely and more efficiently by providing those products as services. It is model in which a physical product is transformed into a service that not only does the same task as the physical product but also does it more efficiently. By the same token, education (e.g., HE) that required the physical presence of students and teachers in the same room using tangible resources (e.g., books, notes, registers) can now be delivered remotely.

3 DESCRIPTION OF CLOUD COMPUTING AND ITS SERVICES

Cloud computing can be defined as a modality that uses advances in IT technologies such as virtualization and grid computing for delivering a range of IT services through software, and virtual hardware (as opposed to physical) provisioned (by data centres owned and operated by cloud providers and/or end users) according to user demands and requirements and delivered remotely through public (e.g., Internet), private networks or a mix (i.e., hybrid) of the two delivery modes.

When it emerged in 2007 the cloud model attracted a great deal of attention from many quarters (e.g., authors, consultants, technology analysts, companies). Many people (including industry analysts and leading figures in the IT world) dismissed it as a "fad" (Hasson, 2008; Johnson, 2008). With time, the model began to gain currency and many of the big players in the IT world (e.g., Amazon, Microsoft, Google, IBM, Salesforce.com) threw their weight behind it. Concerned with being left behind (and with the KODAK experience still fresh in people's minds), many companies jumped on the cloud bandwagon. The IT services that can be offered by cloud computing can be listed in the following three main areas (Sultan, 2011):

- Infrastructure as a Service (IaaS): Products offered via this mode include the remote delivery (through the Internet) of a full computer infrastructure (e.g., virtual computers, servers, storage devices). Some of the most notable vendors under this category include Amazon's EC2, GoGrid's Cloud Servers and Joyent;
- Platform as a Service (PaaS): Services provided by the traditional computing model which involves teams of network, database, and system management experts to keep everything up and running. (e.g., operating systems, databases, middleware, Web servers and other software) are now provided remotely by cloud providers under this category. Some of the early market leaders in this area include Google's App Engine, Microsoft's Azure, Amazon Web services, and Force.com (supplied by Salesforce.com);
- Software as a Service (SaaS): Under this layer applications are delivered through the medium of the Internet as a service. Instead of installing and maintaining software, one can simply access it via the Internet; thus freeing oneself from complex software and hardware management. This type of cloud service offers a complete application functionality that ranges

from productivity applications (e.g., word processing, spreadsheets, etc.) to programs such as those for Customer Relationship Management (CRM) or Enterprise-Resource Management (ERM). Products under this category include Yahoo mail, Google Apps, Salesforec.com, WebEx and Microsoft Office Live.

Interestingly, the notion of providing software as a service (SaaS) is not a new ICT practice. In fact, it predates the emergence of computers themselves. In the 1930s some companies (such as IBM) specialized in producing electric accounting machines based on punch-cards and were able to offer data processing services (e.g., payrolls) to organizations. Providers of such services operated many 'service bureaus' where customers would bring their data for processing in return for a fee. Organizations that were unable to purchase those data processing equipment found it economically viable to pay for those services. Then came mainframe computers in the 1950s and 1960s which continued this practice that became known as 'timesharing'. Organizations that were unable to afford buying mainframes computers would rent the data processing functionality of those machines from a number of providers. Connection to mainframes was achieved through a normal telephone line connecting those massive machines and 'teletypes', replaced afterwards with better visual display machines, at the clients' end (Campbell-Kelly, 2009). One author (Campbell, 2009) refers to the model of cloud computing as "Timesharing 2.0".

4 DESCRIPTION OF MOOCS AND THEIR HISTORY

The history of MOOCs is traced back to early efforts by two Canadians: George Siemens (an educator Professor at the Center for Distance Education) and Stephen Downes (an online learning designer and researcher). In 2008, Siemens and Downes offered a free online learning course entitled "Connectivism and Connective Knowledge 2008 (CCK08)". The course was offered formally through the University of Manitoba and informally through open enrolment (at no cost) to anybody in the world (Fini, 2009). Some initiatives aimed at providing free university education have emerged since. One of those was initiated by the University of the People (UoPeople). UoPeople was founded in 2009 by educational entrepreneur Shai Reshef and is affiliated with the United Nations GAID, the Clinton Global Initiative, and the Information Society Project (ISP) at Yale Law School. Courses provided by UoPeople are free but students are required to pay a one-time application processing fee of US\$50 and subsequent examination processing fee of US\$100 levied per course. The free university has signed collaborative partnership agreements with New York University (NYU) to accept students; and with Hewlett-Packard (HP) - through the Catalyst Initiative - to provide student internship opportunities. It offers undergraduate programs in business administration and computer science and has more than 1500 students from 135 countries.

However, what is very interesting about new developments in free online learning and teaching (L&T) is a surge of interest in MOOCs by leading US universities who seemed keen to deliver their own online courses for "free". Since 2011, MOOCs began to attract a great deal of interest, especially from highly prestigious US universities. Examples include Harvard, Stanford, Michigan, Pennsylvania, Princeton and MIT (to name but a few). Several start-up companies since then have developed partnerships with universities and professors to offer MOOC's. These include companies such as Coursera, Udacity, edX, Udemy and Khan Academy. Coursera, Udacity and edX are among the leading (and high profile) providers of MOOCs.

5 DISRUPTIVE INNOVATIONS

In developing their theory of disruptive innovation, Christensen and his co-authors (see Christensen, 1997¹; Christensen and Raynor, 2003; Christensen *et al.*, 2004) describe two types of innovations: sustaining innovations and disruptive innovations. Sustaining innovations, according to these authors, are often innovations that occur frequently and are implemented by established large companies in order to improve the performance of some of their products or services that have strong market shares.

¹ In his 1997 book Christensen used the term "disruptive technology" which he changed to "disruptive innovation" in his subsequent publications.

Disruptive innovations, on the other hand, occur less frequently and tend initially to have performance problems. However, they are likely to be less expensive, simple and more convenient to use. Most importantly, they introduce a new value proposition. They either reshape existing markets or create new ones. Hence, there are two types of disruptive innovations: low-end and new-market. Low-end disruptive innovations can occur when companies offer “good-enough” products and services to “overshot” customers (i.e., customers content with those products and services) at much lower prices. Wal-Mart’s discount retail store and Dell’s direct-to-customer models are examples of low-end disruptive innovations. New-market disruptive innovations can occur when characteristics of existing products and services (e.g., size, price, complexity) limit the number of potential consumers or force consumption to take place in inconvenient or centralized settings. Apple’s personal computers and eBay (among others) are examples of new-market disruptive innovations. They all created growth by making it easier for people to do something that historically required a great deal of expertise or great wealth. Taking the PC as a prime example, it disrupted the market of mainframe and minicomputers computers by creating a new PC market. It removed the complexity and expense that were associated with mainframe and minicomputers computers and provided a convenient way of using the services that were brought by the digital technology. Like many other disruptive innovations, the PC suffered from many limitations when it first emerged. It was relatively bulky, crashed more often, had little memory, slow processing power and limited storage space. However, with time those limitations were overcome.

On that basis, the servitizing of the IT industry by cloud computing can be classified as a disruptive innovation. It differs from the aforementioned types of servitizations in that it destabilizes an existing market that relies on a physical delivery of a product (be it software or hardware) and creates a new market where delivery of a product is served remotely and does not involve many of the infrastructural requirements that are often associated with the old delivery model. By the same token, the other types of servitization did not create a new market. They were simply improvements to existing products and services. This feature, according to the theory of disruptive innovation, therefore makes early types of servitization “sustaining” innovations.

The same argument (albeit in a different context) can be said about MOOCs. The Web has had a profound (and disruptive) impact on our lives (both as individuals and organizations). It created a new market opportunity, epitomised in online trading or e-commerce, and disrupted many traditional businesses such as those involved in music, books, stocks, etc. Increasingly, the Web is having a disruptive impact on L&T. Since the early 2000s, online L&T was often being provided by institutes (e.g., colleges, universities) as an additional L&T tool (to other existing traditional tools, e.g., class room lectures) or provided by institutes (mostly commercial) as a tool for programmes fully accessed using this mode of delivery.

Christensen, Horn and Johnson (2010) see great potential for online L&T to have a disruptive impact on traditional class-based L&T. This is because there are significant areas of nonconsumption (often one of the main targets of disruptive innovations) that online L&T can meet. Providing examples from the US, the authors list a number of those nonconsumption areas such as offering AP (advanced placement) classes, delivering popular arts, humanity and language courses (shunned by resource-constrained urban secondary schools), homebound and home-schooled students (due to such reasons as suspension or sickness) and offering opportunities to make up credits (due to lack of “remedial” classes available to students who fail a course). The authors see online learning as a classic example of a new market disrupting or substituting an existing business model (i.e., class-based education). They argue:

“This substitution is happening because of the technological and economic advantages of computer-based learning, compared to the monolithic school model. Online technology provides accessibility for those who previously would not have been able to take the course. It provides convenience for a student to fit the course into his or her schedule at the time and place that is most desirable. To varying degrees, it is simpler because it offers comparatively greater flexibility in the pace and learning path. And when it is software-based, it can scale with ease” (Christensen, Horn and Johnson, 2010).

6 PROBLEMS WITH THE CLOUD AND MOOC MODELS

The theory of disruptive innovations suggests that disruptive innovations tend initially to have performance problems. Those problems eventually get resolved with improvements and enhancements. The PC is a good example. The early PCs tended to crash more often, had limited memory, storage and processing power. These issues were eventually resolved. As disruptive innovations in the early years of their development, cloud computing and MOOCs have their own set of problems. Security, interoperability and reliability (non-disruption of services) are examples of the main problems that cloud computing needs to overcome. As to MOOCs, concerns relating to credibility (e.g., gaining qualifications meritoriously) and limited scope for enhancing student experience seem the most obvious problems. Once these problems are overcome (as is often the case with disruptive innovations) the losers will be organizations that did little to embrace the cloud model (e.g., traditional IT providers) and the MOOC model (traditional campus-based educational establishments).

7 NEW SERVICITIZATION MODELS CALL FOR CULTURE CHANGE

The disruptive and servitized nature of cloud computing MOOCs requires a radical response from organizations that provide “traditional” IT products (in the case of the cloud) and establishments that provide educational services (in the case of MOOCs). Organizations develop their own cultural identity as they grow. This cultural identity of organizations is their own way of conducting their business, epitomized in the values exhibited by their employees when they decide which orders are more important, what type of customers should have priority and whether an idea of a product is attractive. As well as defining what an organization can do, it also defines what an organization cannot do. Culture is therefore a double-edged sword. When great changes such as disruptive innovations occur, case studies have shown that organizational culture generates cultural inertia which is so difficult to overcome directly. It is often a key reason why managers fail to introduce timely and substantial change, even when they know that it is needed (Christensen and Raynor 2003; Henderson 2006; Tushman and O'Reilly 2002, cited by Yu and Hang, 2009). Ignoring the signs of disruptive innovations by incumbent (i.e., well established) organizations is well articulated by Christensen, Anthony and Roth (2004) in this quote:

“An incumbent’s strengths are its weaknesses. Its values, which make sure it delivers excellent products to demanding customers, stop it from going after markets where ultimately its strongest competitors will forge their processes and values. Incumbents’ processes, those that allow it to serve its customers well, are weaknesses when the game changes and new capabilities are necessary. Fleeing from the disruptive attacker feels good in the short term but further deprives the incumbent of the necessary skills to compete. The end can come swiftly and can appear stunning to the untrained eye”.

8 CONCLUSION

The literature of servitization is relatively new. Dating from late 1980s, this literature was an academic recognition of the developments that manufacturing companies had introduced in order to provide better products and services to their customers in order to avoid having to compete on cost alone. Later developments in the literature took into consideration the dynamic conditions of a world that is increasingly shifting from a manufacturing to a service economy where services have assumed greater importance.

Cloud computing and MOOCs are portrayed in this article as new disruptive (and servitized) innovations. The cloud has servitized the IT industry by enabling the scalable delivery of IT services (both hardware and software-related) remotely through the medium of the Internet. By the same token, MOOCs, as argued in this article, have the potential to servitize the HE industry by enabling the scalable delivery of educational services in a manner that has not been experienced before. Indeed, the

MOOCs phenomenon could end up doing to HE what cloud computing did to IT by providing education as a service (EaaS) that can potentially be consumed on a scalable pay-as-you-go basis.

Current evidence suggests that servitizing the IT and educational industries is an innovation that has the potential to grow in popularity, especially in the present global economic environment of budgetary cuts and austerity. The success of this growth will depend on the extent to which current problems with both innovations can be resolved. It will also depend on the extent to which decision makers in those industries are willing to embrace cultural changes and are able to read the signs of disruptive innovations.

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SOCIAL MEDIA – HOW COMPANIES CAN IMPLEMENT SOCIAL MEDIA ACTIVITIES EFFECTIVELY

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ABSTRACT

We all live in a fast moving business environment in which most people are connected by using social media channels. Social media channels generate possibilities for people all over the world to connect with each other in order to share e.g. ideas, opinions, thoughts and recommendations on products or services by using only an internet connection. When the first social media channels started, people needed a computer and a stable internet connection in order to start social media activities but with the invention of smartphones, people started to use social media channels not only on a computer but furthermore wherever they were. The social media activities exploded and not only private individuals realised that social media can generate a lot of advantages.

This paper will focus on the possibilities that companies have using social media effectively. Today many companies started twittering, have a presence on facebook, LinkedIn or even have video advertisements on Youtube but the question is now, are they using these channels effectively? Have they organised their social media activities in a structured way?

Within this paper, the authors will first define what can be understood of “social media” in order to build up a common understanding and then start classifying social media and define which channels can be used in order to get customer insights and understand the voice of customers.

The authors will also evaluate what companies should do when starting social media effectively. This necessitates the evaluation of how companies should start to be a “social company”, how companies should set-up a social media strategy followed by specific social media goals and how these goals can be aligned with their overall business goals.

KEYWORDS: Social Media, Organisational Capabilities, Literature Research

1 INTRODUCTION

Social Media is a topic that is more important than ever before not only for private individuals but furthermore for companies acting in a business environment. Almost all companies start being active in Social Media channels but most activities fail since there is no detailed strategy behind it. In order to successfully implement Social media activities, companies should evaluate the most beneficial Social Media categories for communicating with their target groups. Furthermore companies should

define the most important goals they would like to reach with Social Media activities and follow key prerequisites in order to generate a competitive advantage in the future. Within this paper, Social Media will be categorized, the most important marketing goals will be briefly explained and ten most important key prerequisites will be mentioned in order to set-up Social Media activities for companies effectively.

2 DEFINITION OF SOCIAL MEDIA

Social media consist of two words: “social” and “media”. The “social” part reflects that social media is related to humans with the constant need to connect with other humans. Connecting to others is done in many ways. Humans build networks, groups and communities in order to exchange their thoughts, ideas and experience while socializing together. The second part “media” is the instrument by which humans connect with each other while not being at the same location. At the beginning of humanity, they used drums and bells to send messages to each other. This kind of communication developed to communicate by written words, telegraphs and telephone until it reached the possibility to connect via text messaging, media sites, mobile phones and new media technology. The word “social media” therefore stands for connections between humans around the globe using new media technology (Safko, 2010 page 4). Before Social Media had been established, the communication was mostly based on the one-to-many approach using traditional media and mass media like Newspapers, Radio or TV. With the use of Social Media, this approach significantly changed since the communication today is mostly based on a many-to-many approach. If companies for example launch a new video clip on YouTube for example, users have the possibility to place their comment and even to share this clip with all their friends. This shows that social media changes existing communication approaches into completely new dimensions (ECC-Handel, 2010). Social media aims to cross-link users and their cooperation and communication via the internet in order to build network communities. Today, social media is used by private users for exchanging ideas, opinions, experiences and thoughts but also by companies in order to build a stronger connection to their customers. With the use of social media, companies can listen to their existing customers as well as to potential clients and better identify their needs and requirements. People do not only use social media to communicate, but also for cooperating and working together while using written texts, photos or even videos. Social media is based on specific platforms that allow users to start networking. These platforms can be e.g. weblogs, micro blogs, chats, wikis, podcasts or forums (Gabler Wirtschaftslexikon, 2013).

3 CLASSIFICATION OF SOCIAL MEDIA

Social Media offers a broad spectrum of possibilities for individuals as well as for companies in order to get in contact and meet new people, or reach existing or potential customers with clear messages. In this paper the spectrum of Social Media will be classified into 15 different categories based on the Social Media Specialist Lon Safko (Safko, 2010) in order to get a clear picture how Social Media can be used effectively.

Category 1: Social Networking In this category, all platforms are included that educate, share, discuss, interact and build trust by communicating with each other. (Safko 2010 page 10) One of the most prominent social networks is Facebook with around 1.01 billion people using the site each month (Facebook Newsroom (2012). On Facebook, users are able to get friends, participate on events, enter different groups and share whatever they do with the rest of the world (Singh, Diamond 2012, page 131-133). Today not only private persons are using Facebook. Most of today's companies have their own Facebook fan page in order to inform customers about upcoming sales initiatives, vacant company positions and company news.

Category 2: Publishing This category of social media is a development started a long time ago. To publish something means record something to be able to pass it on to other generations. This started with clay tablets, hieroglyphs moving to handwriting and the printing press and entered later the computer world with emails, text messaging and photo/video sharing until twittering today. This was a huge development. In the context of social media nowadays, publishing facilitates collecting thoughts

and ideas and for the first time, there is the possibility to share all this information on a global basis. It is also called “Word of Mouth at the Speed of Light” (Safko, 2012 page 471). The most prominent example of publishing is Wikipedia. Wikipedia encourages and empowers all people around the world to publish any information to different topics. Anyone can add content to any page as long as they follow the Wikipedia edition policies (Safko, 2012 page 471).

Category 3: Sharing Since photography has been invented; people share pictures in order to remember special moments. Some years ago, all pictures had to be developed and printed before they could be shared between others. This was often expensive and complicated. After the invention of digital cameras, photo sharing became easier as ever before. The internet offers a huge platform for photo sharing and different companies immediately launched web pages that support this process. Today everyone knows web pages like Flickr (yahoo owned), Picasa (Google owned) or other pages e.g. Photobucket (share, find and search photos, videos and graphics) or Slide (telling stories through videos and photos) (Safko, 2012 page 497-503).

Category 4: Audio This category is very powerful. Often people buy an audio book instead of a normal book because they can listen to it while driving a car for example. Audio allows people to relax, sit back and listen to the author telling content with human nuances, dramatic pauses or with inflection. People can create images in their minds that is not possible while watching a video. The fantasy will be animated and people can watch their created images play out in their minds only based on a story that the author is telling them (Safko, 2010 page 11). One of today’s most prominent examples is iTunes. iTunes is a media application that allows users to access and organize music, films etc. In the iTunes store, users are able to buy songs, podcasts, audio books or other digital media. With interface software iTunes offers the possibility to interact with products like iPhones, iPads or iPhones (Safko, 2010 page 512).

Category 5: Video This category is a highly popular social media category. Most of the people do not open a book and turn on the radio when they are coming home after a busy day at work. They furthermore turn on the TV and try to relax. People love video because they get the feeling of not being alone in a room but rather becoming involved in the video that is taking place at the moment. If people watch a movie they are often getting emotionally involved in the scene. This can often be seen in facial expressions or body language of people watching a movie. In a study it has been estimated that only 7 percent of the communication comes from the word itself, 38 percent from the voice and 55 percent of communication comes from the body language (Safko, 2010 page 11). One of the most popular examples is YouTube. YouTube is an online platform on which people can upload and share their videos. Those videos range from amateur videos to professional levels of media. Users have the possibility to comment on videos and express what they liked, or what they think about it (Safko, 2010 page 531).

Category 6: Microblogging This category is continuously used in today’s society. Talking about microblogging mostly means talking about Twitter. Microblogging is more than text messaging. The reason why Twitter became successful was best put by Samuel Clemens (Mark Twain) as he said in the late nineteenth century “I apologize for the length of my correspondence. Given more time, it would have been shorter” (Safko, 2010 page 11). Some outstanding uses of microblogging are that people can have real-time updates on news, events, or e.g. natural disasters, businesses can follow what has been said about them or their industry, individuals can promote themselves, celebrities can update their fan groups easily and with microblogging topics like fundraising or other activities for charity can be easily raised and successfully realized (Qualman, 2011 page 153).

Category 7: Livecasting This is a special type of social media and either people love it or people hate it. In today’s World Wide Web, there are more and more livecasts in which people are livecasting their lives for some months 24/7. Livecasting is the ultimate in reality television and it is available and free to access for everyone. Famous examples for livecasting and reality television are the Kardashians and the Hilton family in the US (Safko, 2010 page 12).

Category 8: Virtual Worlds Many famous companies like IBM, Dell, CNN, Disney and Starwood Hotels are using virtual worlds in order to hold meetings in their headquarters while different experts are participating from all over the world in order to exchange ideas or watch presentations (Safko, 2010 page 12). Second Life is one of the most famous virtual worlds which is used by monthly engineer meetings from IBM. Using this type of social media, ideas can be expressed in a more visualized way. For example buildings can be easily built in a virtual world and ideas can be implemented right away without sitting together with an architect (Safko, 2010 page 12).

Category 9: Gaming Over 17 million people are playing Halo 3, 17 million people are playing World of Warcraft. This is a high volume so many Fortune 1000 companies are participating in gaming in order to build brand recognition. For example Hewlett-Packard used billboards that have been included in auto racing games. Other companies develop games which are placed on their website in order to tell customers information about their products in a playful way (Safko, 2010 page 12).

Category 10: Productivity Applications These applications are used by companies using event management tools, peer to peer downloads, word processing, alerts and spreadsheets in the cloud. For example Google Alerts allows companies to create alerts against their Google searches and receive the results through e-mails. For creating online surveys, the productivity application SurveyMonkey is often used. This tool provides users with the possibility to customize and design their surveys by choosing different question options in order to get the best result out of the survey (Safko, 2010 page 585).

Category 11: Aggregators This category of social media contain web sites that allow users to choose the type of content they want to see, where they want it to come from, present content to them in an organized page and repeats it automatically. Aggregators provide users with the newest information on blogs in which they are interested, news on different web pages or new photos and videos which are all displayed on one page. Aggregators are free to be used by everyone (Safko, 2010 page 12). Examples for aggregators are Google Reader, MyYahoo! or FriendFeed (Safko, 2010 page 599).

Category 12: RSS This is the abbreviation of Really Simple Syndication and is the name of the technology. A RSS feature on a web-page or on a blog allows users being automatically notified whenever there is an update available (Safko, 2010 page 12). Therefore users do not have to check the same web pages or blogs day by day in order to get any information on latest news. Users only have to determine the web sites on which they want to have updates from. Examples for RSS are Google FeedBurner or PingShot (Safko, 2010 page 617).

Category 13: Search Engines The search function is the most used function on the internet. Whenever people have a question, they will search for the answer in the internet. The problem of search engines is that a user has to know what he or she wants to search for. For example if a user types in birthday gifts for mums he/she will get some few inspirations out of the results but since there are often far too many results, they are often overwhelming and confusing (Qualman, 2011 page 10). For companies that means a Search Engine Optimization (SEO) is more important as ever before. Today there are billions of different web pages available and if one company wants to be found by customers and potential customers, they have to optimize the search engine function. SEO, tags, external reputable links, specific keywords and fresh content must all be added to a company's web page's Google mix. The most prominent search functions are Google Search or Yahoo! Search (Safko, 2010 page 632).

Category 14: Mobile This is the social media category that is known as the fastest-growing segment. In today's society, there are three cell phones calculated for each person on the planet no matter if male or female, or if child or adult. Internet-connected computers are mostly too expensive especially for people in Third-World-Countries but mobile phones are affordable. Therefore mobile phones are used more often. With new technologies, people have the possibility to stay connected around the globe and this is easily manageable via mobile devices. With cell phones, people are able to send emails, blog something via twitter, getting and sending messages like SMS or via Whatsapp sharing pictures and regardless the internet fee, those services are mostly free to use (Safko, 2010 page 14).

Category 15: Interpersonal This category includes also a feature rich technology that allows companies to contact their customers. For example some companies host a meeting for another company's employees via webbing. One example of interpersonal services is GoToMeeting. This is an online meeting service that allows companies, individuals and organizations to communicate through the internet. Users have to pay a small annual or monthly fee in order to be able to hold as much online meetings as they want. Screen sharing, meeting recording and VoIP (Voice over Internet Protocol) are features that are offered to users in order to benefit from their online meetings as much as possible (Safko, 2010 page 655).

Social Media is of course not limited to these categories but these are the most important categories that have to be kept in mind when talking about Social Media. How these categories are used by private persons and what possibilities they offer for companies will be explained in the next section.

4 USE OF SOCIAL MEDIA FOR COMPANIES AND INDIVIDUALS

Social Media is not only an instrument to get in contact and broaden the network for private individuals. Companies across all industries are starting to implement Social Media activities in their business strategy in order to start the direct communication with their customers or even potential customers for the future. In this section the different use of Social Media for both parties will be explained:

4.1 Social Media use for private persons

Private persons use social media mostly to stay in contact with friends and family members but also to share ideas, opinions and thoughts about all topics they are interested in. Nowadays people search answers to their questions first online before asking anyone else no matter if their questions are health care related, product related or deal with any other topics. Many people consult Social Media channels before buying a new product or service. They search for recommendations and advantages other people publish in order to take an informed buying decision. Also if people have a health issue, they use the internet and mostly social media forums in order to virtually meet people with the same issue and exchange experiences and opinions how the health issue can be resolved efficiently. There are many other ways that private individuals use Social Media channels but since companies are using Social Media channels effectively, this paper will focus on the business use of Social Media.

4.2 Social Media use for companies

Companies that use Social Media have to follow specific business goals in order to stay competitive. Mostly the main goal is the creation of a long-term relationship with customers as well as the creation of confidence and loyalty. Furthermore companies aim to improve their brand image as well as increase their degree of brand awareness while being active in different Social Media channels. (Kreutzer & Hinz, 2010, page 10) In today's business environment, it is not enough for companies only to start single Social Media activities without having a specific business goal behind it. The effective use of Social Media allows companies to quickly change online content and instruments if they realise that the customer reaction is not as expected before damaging the company reputation in the market place. Within this paper the six most important business and marketing goals will be briefly explained in order to give an overview about the effectiveness of Social Media within a business environment.

4.2.1 Management of reputation

With the use of Social Media channels, companies have the possibilities to create a positive reputation and align their marketing activities closely to their customers. (Kreutzer & Hinz, 2010, page 11). If companies launch any Social Media activities, customers mostly react in an emotional way. This can mean that customers comment and recommend products and services in a positive way but it is also possible that negative emotions will come up that need to be mitigated. Therefore it is necessary to use Social Media channels to effectively listen and communicate to their customers. Companies can actively correct negative perceptions but also strengthen positive emotions and reward customers that engage themselves for a product or brand (Kreutzer & Hinz, 2010, page 11). With the use of Social

Media channels, companies can also distribute specific press released directly to the right audience and focus group. Therefore the whole public relations management can be aligned with Social Media channels and can follow a Social Media strategy.

4.2.2 Increase of brand awareness

Most companies create brand awareness through Social Media channels while creating a specific brand experience (Kreutzer & Hinz, 2010, page 10). If many people talking about a product or service while exchanging experiences, opinions, ideas and thoughts online, the brand awareness increases automatically. This positive word of mouth effect can increase interest of new potential customers and increase the brand awareness for the whole company. With the use of Social Media, product or service related content can be distributed authentically, since people send their recommendations directly to friends, for example, with who they have a personal relationship. This increases confidence and has a positive effect on the brand image (Kreutzer & Hinz, 2010, page 10).

4.2.3 Customer loyalty

With the use of Social Media, companies can get directly in contact with their customers and start a direct dialogue with them. This dialogue encourages the company to set-up a personal customer service while other customer can also follow and read the communication between the company and the specific customer. Today, it is not enough for companies to hold a high monetary market value. The importance of holding a high social market value through communities is even more important. If the social market value increases, also the monetary market value will increase (Kreutzer & Hinz, 2010, page 11). Companies have the chance to build up a specific customer community around their products and services based on different Social Media channels in order to offer customers a common brand and product experience which is highly important in today's business environment (Kreutzer & Hinz, 2010, page 11). Customers that feel they are understood and get the feeling that the company listen to their ideas, thoughts and comments will increase their loyalty to the brand almost automatically (Kreutzer & Hinz, 2010, page 11).

4.2.4 Innovation Management

Companies can also integrate their customers in the process of new innovations while using Social Media channels. If companies start to communicate with their customers and ask about new ideas for new products, the customers get the feeling they are understood and feel the products are aligned directly with their customer opinions. Within Social Media channels, companies can also start a small innovation competition in which customers can participate and the winner with the best idea will be rewarded (Kreutzer & Hinz, 2010, page 12). Social Media channels encourage companies to obtain customer insights and product information that are highly important for the creation of their product portfolio. The dialogue between companies and customers and also between customers itself offers companies the possibilities to gain insights of customer experiences, requirements, expectations and desires that can then be translated into new products and services (Kreutzer & Hinz, 2010, page 12).

4.2.5 Increasing traffic

Companies that establish a presence on a Social Media channel aim to increase their traffic. This means customers should access the specific channel as often as possible to seek for more information about the company, products or services. Traffic therefore means number of visitors on a homepage for example on the company facebook page. If the traffic on company specific Social Media platforms is high, the company has many customers that are following new product and services and will then share the information they got with their friends and followers as well. Some companies link their Social Media platforms directly with their online shop. This can also result in increasing sales since visitors will be directed directly to a sales platform if they are interested in a specific product or service (Kreutzer & Hinz, 2010, page 10).

4.2.6 Search Engine Optimization

A company reaches the confidence of a customer if it is present in different Social Media channels. This means that people talk about this company, link the company to different channels and the more links a company reaches in different channels, the more people talk about the company itself and about its products and services (Kreutzer & Hinz, 2010, page 10). This can be in a positive view but also in a negative direction. Different Social Media profiles will be listed in different search engines. Google for example offers users the possibility to cluster search results in pictures, videos, blogs, social networks and different discussions. If lots of people link a company within their discussions in different Social Media channels, the company itself appears on the top list when people search for different key words related to their products or services. This can be a huge advantage compared to other competitors and therefore companies seek to optimize search engines in order to get more visitors on their Social Media profiles (Kreutzer & Hinz, 2010, page 10).

5 10 PREREQUISITES FOR COMPANIES TO IMPLEMENT SOCIAL MEDIA ACTIVITIES (LOVETT)

In order to establish Social Media activities in companies effectively, John Lovett (Lovett 2011), defined ten prerequisites that need to be taken into consideration. These prerequisites can be seen as Social Media must-haves:

1. **Strategy:** A company needs a clear strategy when implementing Social Media activities. This strategy should contain specific goals that should be reached with Social Media in order to evaluate if the company is on the right track. The strategy should be seen as a future roadmap to guide the company through Social Media activities (Lovett 2011, page 17).
2. **Audience:** A company must identify its audience since Social Media activities start direct communication with third parties like customers. Therefore it is highly important that the target audience will be evaluated in order to communicate in the right way through the right channels (Lovett 2011, page 17).
3. **Commitment:** People within a company need to be committed to all Social Media activities otherwise, activities will fail. If a company launches e.g. a facebook page, someone needs to be committed in order to update the page with new information on a regular basis. Without the commitment of the organisation, a company will fail to establish Social Media successfully (Lovett 2011, page 17).
4. **Content:** Communication through Social Media channels should be done continuously and creatively. The audience needs clear messages to talk about. The most successful Social Media communications starts with an idea or statement which will be discussed by the customers. The company itself acts only as listener in order to gain perceptions about customer requirements and expectations in order to identify new ideas based on customer insights (Lovett 2011, page 18).
5. **Staff:** For the successful implementation of Social Media activities, a company needs to assign dedicated staff members to these activities. This means that Social Media should be seen as equal to customer service or product development for example. Therefore it is extremely important to have dedicated staff members being responsible for all social media activities the company will launch in the future (Lovett 2011, page 18).
6. **Identity:** A company should act authentically across all Social Media channels. This means that Social Media should be based on a genuine and authentic approach since consumers trust a company and do not want to be disappointed by finding out that different Social Media activities have been faked or pretend to be different. Therefore a company should create its own identity in order to build trust and confidence for all customers (Lovett 2011, page 18).
7. **Metrics:** Social Media activities should be measured. This is one of the key prerequisites for a company establishing Social Media activities effectively. Measuring means having the possibility of setting up milestones and checkpoints in order to evaluate how effective different activities are. Social Media activities that are not measured can be seen as a blind effort (Lovett 2011, page 18).

8. **Policy:** In order to control Social Media activities, a company should establish a Social Media Policy. This policy determines what is acceptable and what must be avoided. This becomes extremely important within a corporate environment where people are interacting with and learning from customers (Lovett 2011, page 18).
9. **Crisis Management:** Through Social Media channels, people have the chance to send information around the world within a few seconds. This information can be positive but also negative for the company. Negative comments can always damage the company's reputation; therefore an effective crisis management strategy is highly important. Having defined action plans and escalation paths can mitigate social surprises and prevent companies from reputational damage (Lovett 2011, page 19).
10. **Fortitude:** Starting with Social Media activities will always bring up some failures, customer resistance and scepticism. Therefore a company must have a strong fortitude in order to learn out of failures to improve their activities in the future. Lovett wrote "...the best experts around will advise you to fail fast and fail often so that you can learn from the bad ideas and progress quickly to the good ones." (Lovett 2011, page 19).

If a company takes all ten prerequisites into consideration, Social Media activities can be implemented successfully and efficiently in order to stay competitive in the future.

6 SUMMARY

Social Media is one of the most important topics not only for private persons but also for companies. To evaluate which Social Media category fits best and define specific goals a company would like to reach with Social Media activities are the most important key building blocks for implementing Social media activities effectively in the future. With the establishment of the right Social Media strategy, a company can reach important competitive advantages and can strengthen their future position on the market place due to a close alignment of the product portfolio with customer requirements which will be more important than ever before.

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