Exploring Servitization Readiness in Manufacturing Firms

Giulia Teso

BA, MSc (Industrial Design)

Director of Studies: Professor Andrew T. Walters, Director of Research - PDR, International Design and Research Centre, Cardiff Metropolitan University

Supervisor: Prof. Mark Francis, Cardiff School of Management (CSM), Cardiff Metropolitan University

Supervisor: Dr Katie Beverley, Senior Researcher, Eco Design - PDR, International Design and Research Centre, Cardiff Metropolitan University

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ABSTRACT

For commoditised and mature markets, where consumer expectations are rapidly changing, manufacturers have increasingly begun to consider services as an integrated part of their offering. The shift from goods production to service provision affects the way offerings are created, exchanged and promoted. Servitization is more than adding services to products; it is a cultural and organisational phenomenon.

This thesis is an exploration of servitization readiness within manufacturing firms. It combines two broad concepts: design and readiness for service.

Longitudinal design cases were developed with three manufacturing companies who had expressed an interest in growth through the development of services. The selected companies have traditionally been involved in goods production, and have recently started engaging with services in different ways. Barriers and drivers for the transition from product to service were identified within the literature review and used to inform in-depth interviews with the companies. The data was analysed and informed the development of a semi-structured questionnaire to be deployed with the firms for further information gathering. This research was used to develop a readiness framework. The readiness framework is an assessment tool that allows manufacturing companies to understand where they sit in the servitization journey. In doing so, it raises awareness of the nature of change needed for service implementation.

The deployment of the readiness framework and companies’ feedback showed that the firms are at different stages in the servitization journey. In discussing the potential of service within the
organisations, the main barriers in implementation stem from the lack of fully grasping the notion and the benefits of servitization.

The readiness framework attempts to bridge previous studies and models offering companies a tool to understand the nature of change needed to undertake servitization. It raises awareness amongst firms that undertaking servitisation is not just about adding services to an existing product offer, but can significantly affect the internal culture, structure and practices.
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_Scrivere un libro è un po' come correre una maratona, la motivazione in sostanza è della stessa natura: uno stimolo interiore silenzioso e preciso, che non cerca conferma in un giudizio esterno._

[Haruki Murakami, L’arte di correre]

_In this sense, writing novels and running full marathons are very much alike. Basically a writer has a quiet, inner motivation, and doesn’t seek validation in the outwardly visible._

[Haruki Murakami, What I talk about when I talk about running]
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ACRONYMS

BSI  British Standard Institution
B2B  Business to Business
G-D Logic  Good-Dominant Logic
KPI  Key Performance Indicator
NPS  New Product Development
NSD  New Service Development
PSS  Product Service System
SME  Small to Medium Sized Enterprise
S-D Logic  Service-Dominant Logic
1 INTRODUCTION

Over the last two decades companies have faced radical changes in the way people connect, think and work together (Pine and Gilmore, 2000; Pine and Gilmore, 2011). We are experiencing a cultural change from ‘product oriented’ to ‘service oriented’ consumer patterns. Schwab (2016) has argued that we are now in the fourth industrial revolution characterised by increasing blurring of the boundaries between commodities, goods, services, experiences and transformations. Historically, commodities and goods were the main point of interaction between users and firms; and, despite the apparent ‘newness’ of services for value creation, they are rooted in a human past where services were fundamental to human adaptation and the organisation of societies (Blomberg and Darrah, 2015). Dov (2014) claims we have shifted from a knowledge economy to a human economy. It appears that, as customers and stakeholders develop a more sophisticated understanding of service, they seek more satisfying experiences and transformations from their interactions with both tangible and intangible products. In this context, the shift from products to services or the development of product-service systems (PSS) requires manufacturers to more effectively define what they sell. Rifkin (2001) proposed that in such a scenario, many things are no longer privately owned, but rather that users pay for access to services and experiences. This shift encouraged companies to adopt a Service-Dominant Logic (S-D Logic) for the creation of value propositions to customers (Vargo and Lusch, 2004a). In response to this evolving industrial context, manufacturers are encouraged to remain competitive by exploiting downstream opportunities to move further towards the customer because the focus on the customer’s activities has gained insight into the customer’s needs, which enables it to further refine products and services (Wise and Baumgartner, 1999).
Designers have begun to expand their offerings from object-based product design to experience-based product and service design (Morelli, 2009b; Wetter Edman, 2009; Kimbell, 2011; Secomandi and Snelders, 2011). The term servitization was introduced by Vandermerwe and Rada (1988) to refer to the emerging process of creating “bundles” of customer-focused combinations of goods, services, support, self-service, and knowledge by corporations. Servitization is an organisational change phenomenon that, on one hand, implies rethinking how the company relate to its customers, what value proposition offers and in which form. On the other hand, it affects the way a firm is internally organised and its relationships in the supply chain and with stakeholders. In order to evaluate the opportunity to control the channel to the customer, a company can assess their readiness and willingness to deploy a product-service system (PSS) as an interface between the firm and the customer. At the lowest level, the development of a more holistic customer offering that incorporates physical products and services can be developed based on customers’ need within the boundaries of the company’s vision. Considering a service design approach, a company might then create a new PSS drawing on the existing company’s capabilities. Taking a wider view, the company might begin to explore the potential for addressing customer value through a new configuration of products and services developed jointly with other partners in its supply chain. Generally, while invention is seen as a cognitive process, innovation is a social process (Reid and De Brentani, 2004); and it explains why Rogers (2003) and Von Hippel (2005) widely described the innovation process in terms of the creation of new products and services, and how it spreads within a community. Baines et al. (2009) describe how the servitization phenomenon affects economics, environment, market and society, technology and knowledge perspectives. However, the servitization literature investigates how current development processes meet the needs of a contemporary market that is characterised through a mix of physical
products and services and this means that the servitisation transition needs to also consider design. The review of the literature will consider New Product Development (NPD) processes (e.g. Takeuchi and Nonaka (1986) and Cooper (2014)); New Service Development (e.g. Shostack (1993) and Clatworthy (2011)) and the emergent concept of Product-Service Systems which has sought to explain the service landscape from a design perspective (e.g. Secomandi and Snelders (2011) and Kimbell (2011)). Design-related skills as well as Science & Technology related skills are significantly associated with innovation, and design-related skills are important for services innovation (Frenz and Lambert, 2014). Because manufacturing is no longer just about production but involves a wider set of activities that create value and benefits for wider society, in the future manufacturing companies are expected to develop an adaptive capacity of their physical and intellectual infrastructures to exploit changes in technology as manufacturing becomes faster, more responsive to changing global markets and closer to customers (UKGovernmentOfficeforScience, 2013).

The servitization process within manufacturing Small to Medium sized enterprises (SMEs) seems to have the potential to create significant impact; there has been little academic exploration into smaller companies - probably due to their heterogeneity, different paths, capabilities and assets (Teece and Pisano, 1994; Eisenhardt and Martin, 2000; Teece, 2007; Acklin, 2013). However, within a UK context, SMEs are recognised as ‘the engine of the national economy’ (BIS, 2013), and it is necessary to understand how the servitization process may affect them.
1.1 AIM OF THIS RESEARCH

The overall aim of this thesis is to explore and identify the most relevant factors for manufacturing firms to undertake servitization. Product-oriented companies have different motivations and are heterogeneous (sector, size, position in the supply chain for instance). There is a perception that they often lack instruments to frame the servitization phenomenon as a whole within their organization and assess their state of servitization.

The objectives of this thesis will address the following:

- To analyse manufacturing firms’ drivers and barriers in the adoption of the service concept.
- To identify motivations and expectations of smaller manufacturing companies in the transition from a product-oriented to a service-orientated strategy.
- To identify the factors related to the company experience and capability as a whole for enabling the development of services within manufacturing companies.
- To identify the level of readiness and awareness for manufacturing companies to undertake servitization and developing service-oriented processes.
- To understand the state of servitization of the firms.
- To understand the nature of change required in the servitization journey.
- To understand the level of guidance required to support manufacturing firms considering increased servitization.

Answering the research questions will contribute to advance the servitization discussion by helping firms to understand the nature of change needed for service implementation, raising awareness on the
transition from product to PSS. This thesis takes a design-research approach to explore how manufacturing companies frame servitization. This is novel exploration, as most Service Design research has followed either consultancy practice or public sector adoption.

1.2 SMALLER COMPANIES

According to the latest statistical data from the Department for Business, Innovation and Skills (2014, 2015, 2016) and OECD, SMEs contribute to the national economy but they need to be supported and facilitated in terms of the inclusion of design to compete in the current market dominated by cost reduction (Löfberg, 2014). Despite SMEs status describing the majority of businesses and largest contributors to the GDP, a considerable proportion of previous studies on the ‘servitization of manufacture’ focused on large organisations, neglecting that Small and Medium Sized Enterprises deserve a specific consideration due their limited resources and capabilities. SMEs are not ‘miniature versions’ of large firms (Welsh and White, 1981). SMEs might have particular characteristics that are worthy of investigation in regard to how service design might be implemented in their context. Changing the scale of a problem illustrates new problems, issues, and opportunities (Eames & Eames, 1978 in Kolko (2011)). Rogers (2003) and Von Hippel (2005) demonstrate two key concepts: the spreading of innovative projects within communities and the creation of new products and services from lead users. Given that the focus is on smaller companies, the concepts above suggest how to create a close relationship between firms and individuals within a design-driven innovation strategy (Verganti, 2011) or from a user-centred service innovation perspective (Walters et al., 2012). According to the European Commission, Small and Medium-sized Enterprises (SMEs) are the backbone of Europe’s economy. They
represent 99% of all businesses in the EU. In the past five years, they have created around 85% of new jobs and provided two-thirds of the total private sector employment in the EU. The European Commission considers SMEs and entrepreneurship as key to ensuring economic growth, innovation, job creation, and social integration in the EU. In the latest statistical release by the Department for Business, Energy & Industrial Strategy (previously Department for Business, Innovation & Skills - BIS), the business population estimated that there were 5.5 million private sector businesses in the UK at the beginning of 2016 and 28.9 million employees, of which 99.9% of the businesses were SMEs employing 15.7 million people. Small businesses account for 99.3% of them. Furthermore, the numbers of small non-employing businesses is increasing, for example 75.3% of private sector businesses do not employ anyone beside the business owner.

It is not clear yet to what extent a company’s size impacts company performance (Berends et al., 2014); although SMEs can be compared to large organizations, they have differing needs, capabilities and drivers. They deserve different attention in the way they are organized, structured and managed. For instance, in a smaller company the owner is often the manager/director (Berends et al., 2014). SMEs lack many of the capabilities necessary to identify, transfer and absorb external ideas and technologies effectively from outside into their firms (Chesbrough, 2010) and a clear innovation strategy is often missing (Acklin, 2010). However, they often have the ability to provide a niche product or service that larger businesses cannot provide themselves, or cannot provide as cheaply – although competing on price is less likely to lead to growth than having a unique product (ORCInternational, 2012). Another key aspect, according to Voss et al. (1998) [as reported in Ates and Bititci (2011)] is that successful SMEs are well prepared for change and have adopted a more formal approach to planning. They are
characterized by a learning–by-doing approach between the top and the bottom of the organisation, and informal internal communication patterns (Berends et al., 2014). This is enhanced by the lack of bureaucracy often managed by an owner or director who is able to take key decisions quickly, enjoy efficient and informal internal communication patterns, and develop strong relationships with customers (Berends et al., 2014). There is lack of long-term and soft requirements of organisational change process (e.g. tacit knowledge and informal decision making; poor management skills as the SME grows) (Ates and Bititci, 2011). In contrast to large organizations, resilience has been identified as a distinctive organisational capability amongst smaller firms (Ates and Bititci, 2011). A study by Van Es and Van Der Wal (2012) on the innovative behaviour of the SMEs over an extensive period of 15 years, states that technical and business process optimization, new types of collaboration, and renewing competencies and developing a fitting strategy are what characterised them. Conversely, Berends et al. (2014) states that prior studies found that small firms do not deploy the formalised processes identified as best practice for the management of new product development (NPD) in large firms. For example, in the decision-making process, two distinct logics act under uncertainty: causation (goal-driven) and effectuation (means-driven). They found that the effectual approach to small firms’ product innovation efforts is conceptualized as: resource-driven, stepwise, and open-ended. To sum up, small companies prefer short-term developments they can control, and incremental resource commitments and risks they can afford. Because large firms differ from small companies, no best practices can be prescribed by the former to the latter.
1.3 SERVICE DESIGN AWARENESS

To date, the application of service design has typically been through external service providers (service design consultancies) or has been limited to multi-nationals enterprises, for example Herman Miller, Rolls Royce’s, Barclays, Philips, Thomson Reuters, Virgin Atlantic, Diageo (Micheli, 2014). While such large companies can create design departments or offices with dedicated people to develop new projects, SMEs lack time, people, and resources, to do the same (Ryan, 2013). As such, the largest section of the economy, Small to Medium Sized Enterprises (SMEs) are precluded from using service design as they have neither the resources to engage external consultants nor the knowledge to develop in-house capability. However, service design can play an important part in developing competitive advantage in the contemporary marketplace (Gebauer et al., 2010). This research will explore the factors that facilitate the development of innovative services (de Brentani, 1991), the achievement of design management excellence (Brigitte Borja de, 2002), and the use of design as a mechanism to change organisations (Junginger, 2007).

Servitization is a multifaceted and complex phenomenon; this thesis will explore how manufacturers frame the service concept, and their motivations and expectations when integrating a service-oriented development process. While large organizations have already successfully implemented services, smaller companies face barriers and need to identify the factors related to their experience and capability as a whole for enabling the development of services.
2 LITERATURE REVIEW

The adoption of a thematic literature review stems from the identification of the multifaceted issues related to the implementation of services within manufacturing. Multiple perspectives in the research communities – mainly management, marketing, engineering and design – have been studying the implications and the strategies used within the transition from product-oriented to service-based offerings. Baines et al. (2013) state that there are five principal research communities developing the ‘servitization’ concept, namely: services marketing, service management, operations management, product-service systems, and service science. Although servitization has been framed through those different disciplines, in this thesis, the literature has been thematically grouped in the following themes:

1- The servitization phenomenon (similarities and differences between manufacturers and service providers and blurring boundaries between them);
2- The transition from product to service (drivers, barriers, servitization as a transformative process);
3- Raising awareness of the heterogeneity among firms (inter-firm and intra-firm characteristics);
4- Design for strategy with the service design research perspectives of servitization.
5- Tools for servitization

2.1 THE SERVITIZATION PHENOMENON

The transactional model is increasingly viewed as ineffectual as a source of competitive advantage. The relational model is now predominant where customers are offered access to products’ functionality (Rifkin, 2001). The progression of the economic value starts from the emerging of goods, the making of products, the
Servitization emerges from the commoditisation of products and the need of manufacturing firms to stay competitive in the market. The term ‘servitization’ was first introduced by Vandermerwe and Rada (1988) to refer to the emerging process of creating “bundles” of customer-focused combinations of goods, services, support, self-service, and knowledge by corporations. Research on servitization has drawn on manufacturing companies (Baines et al., 2011; Baines and Lightfoot, 2013a; Baines and Lightfoot, 2013b) which are evolving their offerings beyond products (Brown et al., 2009). Baines et al. (2009) provide examples of large servitized companies such as: Alstom; ABB; Ericsson; Nokia; Thales; Rolls-Royce; Xerox; WS Atkins. Examples of the shift from product-oriented to service-oriented offering are the introduction of the claim “Power per hour” in the Business-to-Business (B2B) context by Rolls-Royce to describe the new service imperative that overtook the engines’ sales. At the same time, Xerox started to build its business model on the claim “Pay per copy” offering ongoing support of the printers to its customers. There are many forms of servitization (Baines et al., 2009) that defines the product and service continuum (Oliva and Kallenberg, 2003; Gebauer and Friedli, 2005; Neu and Brown, 2005) and that identifies the increasing importance of services and the relative importance of goods. The literature presents definitions and classifications to describe the outputs of the servitization phenomenon: product-service system (PSS); hybrid solutions; and integrated solutions (Baines et al., 2007; Boehm and Thomas, 2013). All these value propositions refer to the ratio between product and service; starting with the services as add-ons to the existing product-based offering, then the increasing importance of services to shape the new offering as presented by product-oriented, result-oriented, and use-oriented (Tukker, 2004; Tukker, 2013). Although a classification is useful to understand and to identify the types of offerings that each firm choose to configure, it does not show or
suggest how the transition from goods production to service provision occurs. Historically, we are brought to see manufacturing and service provision as two separate entities, whereas services come later chronologically. Services are still commonly perceived as adds-on by manufacturing industries, extensions of product to push sales rather than new ways of creating value to customers and companies. Many services are dependent on manufacturing (Benedettini et al., 2009). Nowadays, services have taken over products. Service is considered a competitive factor through differentiation opportunities (Mathieu, 2001b). To develop services, firms start getting closer to customers. IBM-based researchers, Blomberg and Darrah (2015), claim companies raise awareness on the human and anthropological aspects of services. For manufacturing companies, service differentiation represents the main strategic priority, to build on the company's customer centricity and innovativeness (Gebauer et al., 2011). This transformation resulted in a change to the original perception of products as a means of value exchange in transactions and intangible, experiential and interactive aspects of brand and interface, to become essential competitive factors in building relationships with customers. In this thesis, the term PSS has been adopted to refer to offerings that contain product and service components.

In the extant literature, new product development (NPD) and new service development (NSD) are discussed separately. Further, the level of description of the PSS development processes appeared less detailed compared to NPD and NSD. In both cases, the very first phases of the development process, the so-called ‘fuzzy front-end’, are difficult to codify (Reid and De Brentani, 2004; Clatworthy, 2013). Kimbell (2009) investigated the differences between new product development and service design and found that service designers pay attention both at macro (service experience) and micro (touchpoints) level. The “making of service” and the “making of
product” have different meaning and means of value creation. However, companies have been stimulated to start designing services with the same attention as products (Polaine et al., 2013); but, this does not imply that the process is the same. In the literature, there is lack of information on how to frame PSS; how product and service components relate to each other in the development process and the related skills and capabilities needed at each stage. They are usually discussed either for a product or service. In reviewing servitization literature, Brax and Visintin (2016) suggest an integrative meta-model of servitization to compare three different approaches that differ in process and outcomes which are identified as: end-state models; gradual transition models, and stepwise progression models.

2.1.1 MANUFACTURERS

The product design process or New Product Development (NPD) is described as series of stages that a manufacturing firm follows to ideate, develop, prototype and produce goods. The stage-gate model, the idea-to-launch process created by Cooper in the 1980s, is based on companies’ practices but its rigidity has been recently recognized because it does not encourage experimentation (Cooper, 2014). Although new directions are suggested, the next generation of idea-to-launch systems are required to value the potential of the fuzzy front-end (Veryzer, 1998a; Veryzer, 1998b; Reid and De Brentani, 2004; Achiche et al., 2013), with customer involvement (Von Hippel, 2005; Baldwin et al., 2006), and by managing risks and developing a set of criteria to make decisions in all the phases. In the product development literature there is an ongoing debate on methods and tools that encourage firms to take a more innovative approach which affects the way a company is organised. Because of the complexity of reality, the integration and adaptation of firm-specific and context-specific practices and processes define inter-firm heterogeneity and
intra-firm heterogeneity over time. Takeuchi and Nonaka (1986) introduced an interesting perspective to the management of a project team as a rugby team. They encouraged the project team to operate like a start-up company in order to take initiatives and risks, and in beginning to create its own concept. They promoted a shift from a linear to an integrated approach based on trial-and-error, learning by doing, and by challenging the status quo. In large companies, knowledge is transferred within the organization by converting project activities to standard practice. However, a key aspect of the innovative approach is being able to unlearn old lessons (Takeuchi and Nonaka, 1986). This example refers to a large company, and whether this occurs in smaller companies is not yet known, and it is therefore important to explore the role of key informants and where the sources of innovation are. Investigating how industrial design affects the performance of companies, Gemser and Leenders (2001) found that not all companies use the same design innovation strategy; specifically, they found that beside being innovative in the field of products, being innovative with respect to design and design strategy can enhance competitiveness regardless of industry evolution. Ravasi and Stigliani (2012) raise awareness on the potential contribution of management concepts and tools to understand how the form and function of goods come to be defined in the design process, and how they influence and are influenced by social processes in and around organisations. Organisational capabilities rest on complex patterns of cultural, relational, human and technological resources that affect how design is perceived as an outcome, as a process, as the purpose of that process, and as the ability (or capability) to reach that purpose. Therefore, the translation process of inputs into tangible outputs is intertwined in the way manufacturing companies are organised and structured. The absorption of the notion of design seems to define the structure of the organisation. Established goods-based companies have developed and refined over time their development processes and practices that
focus on product quality sold at competitive prices. They usually interact with customers at the sale point during the transaction and often do not see their customers again before the next purchase (e.g. unless the product is not working). Krishnan and Ulrich (2001) see product development as a deliberate business process where fundamental decisions are made by intention or default, and are supported by knowledge and tools, so that in deciding which product opportunities to pursue, they advise that a potential pitfall is to focus on existing markets. Although the main source of revenue for manufacturing firms comes from selling goods, increasingly competing for price is unsustainable in the market. Marketing was originally built on a goods-centered, manufacturing-based model of economic exchange developed during the Industrial Revolution. Any services are dependent on manufacturing. The changing nature of manufacturing - the shift away from product towards product-service systems - means that manufacturing firms today have to offer PSS or integrated products and services in a global context (Benedettini et al., 2009). However, the following manufacturing myths appear to be misconceived in servitization: developed economies do not need manufacturing; manufacturing is producing; value only lies in products; only developed economies can and will pursue high-value manufacturing; and manufacturing capabilities can be acquired and developed quickly. Ulrich and Eppinger (2007) provided an extensive description of product design and development, describing the phases and the implications of the firm in creating new products. Product design practice involves the following: development speed; digital processes; platform flexibility; complexity management; outsourcing and offshoring; customer involvement; innovation networks; and sustainability (Eppinger, 2011). With a lens on the small firms’ perspective, Berends et al. (2014) found that smaller firms follow causation or effectuation logic, or a combination of both, toward product innovation. The effectual approach assumes that goals are created based upon available means and it seems suited to small
firms’ strengths and limitations where small firms’ product innovation efforts are conceptualised as: resource-driven, stepwise and open-ended, and it was found dominant in earlier stages. Causation logic assumes that means are selected to attain goals and it was more visible in the later stages of innovation trajectories. In general, small companies prefer short-term developments they can control, and incremental resource commitments and risks they can afford.

Building on the benefits of product design in the development of new capabilities, it is important to advance the discussion of the value-creation process of product-service systems of manufacturers in transition towards servitization, without precluding either product or service solely at the very front-end.

2.1.2 SERVICE PROVIDERS

Kujala et al. (2013) point out that services are related to verbs (as functions and activities) while products to nouns (objects). This way of thinking of services as activities is not new; Taylor (1969) suggested thinking of ways to do something (in terms of functions) rather than focusing on things. The term service is defined as providing something, doing a particular job or a type of work for the user. Services are generally defined as activities such as tourism, banking, and selling things which are part of a country’s economy, but are not concerned with producing or manufacturing goods (def. by Collins dictionaries). The word ‘service’ has its origins on the verb to serve and it recalls the idea of servitude. The problem is that customer service is often not viewed by manufacturers as an integral part of what the customer buys, but as something peripheral to landing the sale, and that companies that take a manufacturing approach to service problems are likely to fail (Levitt, 1972). So much so that the production-line approach to service suggests that service ‘in the field’ receives the same attention as product ‘in the
factory’. Some remnants about the concept of ‘service’ have been observed by Levitt (1972) because “the notion of servitude communicates historical connotations of charity, gallantry, and selflessness, or of obedience, subordination, and subjugation”. While services are conceived in humanistic terms (as it is adopted in the UCD approach for the user experience), manufacturing is described through technocratic terms (like efficiency and performance that lie below the so called line of visibility). Levitt (1976) theorised the industrialisation of service to look at the hidden services offered in the pre- and post-sales to achieve the efficiency and the effectiveness of manufacturing to services. The point is that to have the service industrialised, the manufacturer has to be introduced to the service-oriented approach and translate the existing expertise into a consistent service experience for the user. Servitization within manufacturing intended as applying service concepts in manufacturing (Voss, 1992) requires a focus on the service operations. Kowalkowski (2010) investigates what the meaning of the service-dominant logic for manufacturing firms was and found out that it implies much more than an increased emphasis on services; it implies a reframing of the purpose of the firm and its role in value co-creation. Services are inherently relational and the service approach is based on how-to-think and not what-to-do (Grönroos, 2007). Service is the application of specialised competences (skills and knowledge), through deeds, processes, and performances for the benefit of another entity or the entity itself (self-service) (Vargo and Lusch, 2004a). The goal of the service providers is to develop service offerings as outcomes and not outputs as it occurs in manufacturing. Successful service providers usually interface with their clients to assist customers throughout the service development process, creating a relationship before, during and after a service is sold. The new service development process (NSD) refers to the process of creating services to assist customers’ functions. Developing services requires an active involvement from a much broader set of functional
specialties e.g. systems design, products specialists and front-line personnel, more so than in the manufacturing sector. In order to identify and visualise all the elements of a system that comprises service and product components, Shostack (1993) developed the ‘molecular model’ that is considered the foundation of service design representations. If service is defined as a social process, and results come from the customer relationship, management is the ability to direct it. The essence of a service economy is the precise matching of complex activity sets between different units (Normann, 2000). The service management system is described as the interactions among market segment, the service concept, the delivery system and the image of the firm with regard to culture and philosophy. Service management as a discipline and practice is considered the basis of social innovation. Both in manufacturing and services, firms should put more attention to strategic human resource development. Culture may also act as a management tool.

Bridging the literature between NPD and NSD, relevant factors for manufacturing firms willing to shift from product to service appear to be: product superiority, understanding of the market and proficiency in marketing operations, measures in terms of sales performance, competitive performance, cost performance, and other boosters. Aurich et al. (2010) introduce three dimensions to describe service design and offering, namely potential dimension, the process dimension, and the result dimension. The first dimension describes the willingness and capability of the service provider to deliver the demand service. Therefore material such as human and information resources have to be allocated. In the second dimension services are considered as processes between providing and demanding units. The service itself is performed on or with these demanding units, and therefore the external factors are integrated in the process. Finally, the result dimension has certain physical and non-physical impacts for the external factors. Shostack (1984) claims that, in order to
deliver, the service firms have to highlight the tangible evidence and make people special. To achieve that, representing services and designing a blueprint helps to: identify processes; isolate fail points; establish time frames; and analyse profitability. Process design is often seen as a management responsibility. Beyond a generally accepted definition of service and a classification of the types of services, service marketing and management literature recognises the strategic role of service (Lovelock, 1983; Shostack, 1987) and the importance of service operations in delivering integrated offerings. Gummesson (1990) considers the design stage as the very first opportunity to influence service quality and to prevent systematic and repeated errors occurring. Systematic design is a necessary prerequisite for service quality; a service design strategy use of systematic procedures (Gummesson, 1990); and, the technological framework for systemic level of design (Morelli, 2002). Service innovativeness (Gallouj and Weinstein, 1997) is rooted in the firm value (Dotzel et al., 2013). Successful services are the results of the way services are designed, developed, delivered. Drawing from manufacturing, the concept of service quality and productivity (Parasuraman, 2002) is reported to quantify how inputs are transformed into economic results in services (Grönroos and Ojasalo, 2004). Vargo and Lusch (2008b) introduced ten fundamental premises to the Service–Dominant logic. Moreover, Vargo and Lusch (2008a) provided definitions for the Goods-Dominant logic and the Service-Dominant logic. The Service-Dominant logic of exchange has the potential to finally break service marketing free from manufacturing (Vargo and Lusch, 2004b). Table 2.1 below is intended to help practitioners in framing the transition:

<table>
<thead>
<tr>
<th>GOODS LOGIC</th>
<th>SERVICE LOGIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Making something (goods or services)</td>
<td>Assisting customers in their own value-creation processes</td>
</tr>
<tr>
<td>Value as produced</td>
<td>Value as co-created</td>
</tr>
<tr>
<td>Customers as isolated entities</td>
<td>Customers in context of their own networks</td>
</tr>
<tr>
<td>Firm resources primarily as operand</td>
<td>Firm resources primarily as operant</td>
</tr>
</tbody>
</table>
While defining services, some limitations have been presented by Vargo and Lusch (2004b) because of the remnants from the good-based manufacturing model. They analysed the dimensions (intangibility, heterogeneity, inseparability, and perishability) that describe services, the corresponding myth and perspective, and their implications. It is been suggested to make goods and goods production more service-like rather than to make service provision more goods-like. However, a more general service-dominant model does not exclusively focus on services. It is therefore more appropriate to refer to a different way of creating solutions using ‘service’ as an inclusive word for a direct or indirect provision rather than support a definite shift from goods production to service provision. Vargo and Lusch (2008a) made a distinction between operand and operant resources of a firm. While the former refer to tangible resources (natural resources), the latter refer to intangible resources such as knowledge and skills. Although there are not generally accepted definitions of service, it refers to the interaction between customers and firms in terms of service encounter (Solomon et al., 1985; Mattsson, 1994); servicescapes (Bitner, 1992); service interface (Secomandi and Snelders, 2011). With services, the human aspect becomes more and more important (Cook et al., 2002; Clatworthy, 2012; DeVine et al., 2012) at the very front end of the development process (Henze et al., 2012; Clatworthy, 2013). Users’ involvement in service design, development and delivery affects existing practices, processes of manufacturing firms and lead good-based companies to revise the way they are organised and structured. Service providers and manufacturers strive to create value for customers and for companies. Value has not only an economic dimension, but also functional and psychological dimensions (Kowalkowski, 2010). For Normann and Ramirez (1993),

<table>
<thead>
<tr>
<th>Customers as targets</th>
<th>Customers as resources</th>
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<td>Primacy of efficiency</td>
<td>Efficiency through effectiveness</td>
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Table 2-1 Goods logic and Service Logic adapted from Vargo and Lusch (2008)
company brought, delivered, and reinvented the value; and strategy is the art of creating value, intended as bridging value to customers and delivering that value at a profit. What makes a solution different from the others is the experiential value of business, the educational value, the aesthetic value, and the entertainment value (Pine and Gilmore, 2011). From an initial concept of value creation, Vargo and Lusch (2008a) extended this concept in terms of value co-creation and value proposition. The supplier's role in value generation is of value facilitator and co-creator (Grönroos, 2011a). The value-creation process developed by Grönroos suggests focusing on the service logic implementation, the increasing importance of the customer as value creator, the quality of interactions between supplier and customers. Experience defines what is valuable to a customer. The value co-creation process-based framework shows that the value proposition exists in order to facilitate the co-creation of experiences (Payne et al., 2008). The importance of recognizing customer processes rests with the need to develop a full understanding of where a supplier’s offering fits within the customer's overall activities. Servitization challenges manufacturers to become more customer-oriented and in offering more than just products. Services and products are intimately and symbiotically linked. Alternatively, services and products can act simultaneously to form a larger entity (Shostack, 1993). Firms can build upon user innovation to be competitive, and there is a direct use-value of the discoveries users make (Baldwin et al., 2006). The degree of openness of the company and its ability to interact with the external world can also be considered as its openness to innovation and its acceptance of external research as key source of knowledge (Laursen and Salter, 2006). To investigate the quality of the decision making process, a broad body of management literature points to the conclusion that decision processes matter to the performance of the project first and foremost, and to the performance of the firm subsequently.
2.1.3 BLURRING BOUNDARIES BETWEEN PRODUCT AND SERVICE

The difference between products and services is more than semantic (Shostack, 1993). In describing similarities and differences between goods-dominant (G-D) logic and service-dominant (S-D) logic, Vargo and Lusch (2008a) see that:

"The most critical distinction between G-D logic and S-D logic is found in the conceptualization of service. In S-D logic, service is defined as the application of competences (knowledge and skills) for the benefit of another party. The use of the singular "service" as opposed to the plural "services", as traditionally employed in G-D logic, is intentional and non-trivial. It represents a shift from thinking about value in terms of operand resources—usually tangible, static resources that require some action to make them valuable – to operant resources – usually intangible, dynamic resources that are capable of creating value."

Nijssen et al. (2006) explored similarities and differences in product and service innovation and found that NSD and NPD may be considered to have the same underlying dimensions of innovation. However, "the stronger impact of willingness to cannibalise routines in service" rather than product context and R&D strength, was found to be more important in developing radical new services than new products.

Although products and services are described as separate categories of offerings, services have always co-existed to products more or less formally. Either in product or service context, value is created through intra-firm and extra-firms interactions. The value of co-creation in development is proved to positively contribute throughout all the phases from ideation to diffusion (Normann and Ramirez, 1993; Prahalad and Ramaswamy, 2004b; Payne et al., 2008; Grönroos, 2011b).
There is a convergence between manufacturing and services (Gallouj and Weinstein, 1997). Servitization encourages companies to consider customer proximity as the starting and focal point for manufacturing companies to develop their service-oriented offering. The blurring boundaries between product and service lead to the introduction of PSS. PSS are often marketed as products, “and several aspects of the development of such systems are related to the discipline of design, from the analysis of technological potentials to the investigation of users’ behaviour and attitudes with respect to new products, technologies, and services” (Morelli, 2002). Little is known on how design is linked to service (not as an output but as an input/new framing system). Focusing on the differences between NPD and NSD, Kindström and Kowalkowski (2009), in their study, pointed out the inter-relationship between the two processes, and their overlaps. To develop service offerings, firms are advised to look at the established practices and routines, the existing terminology, how to balance flexibility and formality, and how to visualize the service offerings internally first and to new or existing users later.

In PSS environment, companies are required to excel at either a product leadership or operational level. For manufacturers to be both effective and efficient, they need to be able to understand how their customers value their services and be able to configure their products, technologies, operations, and supply chain to support this value offering. All of these elements could lead to a minimization of material flows in the economy while maximizing service output or user satisfaction (Tukker, 2013). In light of the 10 cases studies on PSS reported by Goedkoop et al. (1999), it can be concluded that the value of the co-creation process at the beginning of the development process is a key aspect to raise awareness of PSS in companies that are willing to be servitized.
2.2 TRANSITION FROM PRODUCT TO SERVICE

In the extant servitization literature, successful and unsuccessful cases of the transition from product to service are discussed. Manufacturing firms are encouraged to go downstream (Wise and Baumgartner, 1999); to work in the aftermarket (Cohen et al., 2006); and to go beyond products (Brown et al., 2009).

In achieving this, firms have to start facing customers from the very front-end of the development process (Walters et al., 2012). According to Baines and Lightfoot (2013a), PSS is generally concerned with moving towards offering greater integration with services and moving towards offering greater integration with products (going upstream). Manufacturers have to deal with a constant tension between integration and separation of offering, people competences, firms, suppliers and competitors (Voigt, 2016). Examples on how large organisations have shifted from good-based production to service-based provision have been well documented (Mathieu, 2001a; Oliva and Kallenberg, 2003; Brax, 2005). The drivers and barriers related to this phenomenon and the types of value propositions based on the integration of product and service are also discussed (Vargo and Lusch, 2004b; Baines et al., 2007; Tukker, 2013). Manufacturing firms face major challenges when they start the transition from a purely product-based offering to PSS (or solution-based offerings). Shifting from goods-logic to service-logic requires deep understanding of customers to create value propositions based on a relationship (Michel et al., 2008). Numerous authors assert that positive results can come from offering services (Brax, 2005; Gebauer et al., 2005); companies that adopt a service-based approach gain more competitive advantage because services are more difficult to imitate due to the higher specialisation; and they provide long-term relationships with users (Oliva and Kallenberg, 2003). A move into services is not a panacea and improvements in
profits are not automatic (Baines and Lightfoot, 2013a). Some prerequisites are needed, for instance: a better core product platform for a service-based competitive advantage (Grönnroos, 2007); an evaluation of the internal assets and resources available; and, the level of readiness to implement services. Certainly, manufacturing companies possess knowledge and the expertise about their products; but deeper knowledge about internal assets and resources is needed for the additional development of services (Kowalkowski et al., 2013). However, there is limited availability of formalised service design or PSS processes that are useful to manufacturers in making the transition to additional service development. This thesis adopts the definition of PSS by Mont and Tukker (2006) as their concept suggests “the need to link hard and soft issues such as technology and sociology, products and services, and to view existing environmental problems from a systemic perspective” (pg. 1451). Tukker (2004) categorises three types of PSS: product-oriented, use-oriented and result-oriented, whereas services in the PSS field are usually presented as: basics, intermediate and advanced services (Baines and Lightfoot, 2013b; Baines and Lightfoot, 2013a). From a design perspective, Morelli (2003) borrowed a set of criteria previously proposed by Bijker et al. (1989) to describe the technological framework applied to PSS. The new operative paradigm suggested by Morelli (2009a) looks at the social and human components of the service as services that are social constructions; thus, customers should be an active part of the value co-production process. Mathieu (2001b) presented “service manoeuvres” to indicate the typology of actions to take in manufacturing when moving to service offerings. Brax (2005) stated that manufacturing businesses that approach services require a different organisational setting than goods, because an incremental approach to servitization is inadequate for anything other than the most basic of new service development. In order to convince managers to believe in the economic potential of an extended service business, Oliva and
Kallenberg (2003) suggest focusing on understanding the potential of service companies; the competencies needed for such a transition; and the deployment of a successful service strategy. For instance, increasing service quality and scope might extend the product’s useful life, thus reducing its replacement sales and increasing the quality and durability of products might reduce future service revenues. In the literature, the servitization process has been mostly discussed through the lens of large manufacturing companies who have available resources to engage external consultants or can invest in the development of in-house capabilities. Moreover, it has been discussed through an organisational lens, leaving a gap in the way the process really occurs from a practical perspective. There is much rhetoric amongst the design community on how design provides practical solutions to complex industrial problems; therefore, it is timely to begin to investigate how design, specifically service design, might play the role of the interface between theory and practice in the implementation of PSS in SMEs. Because of the transition from product manufacturing to service provisions has a strong behavioural dimension, seven behavioural processes have been presented to assist managers in the transition from products to services (Gebauer and Friedli, 2005). Gebauer and Friedli focussed their research on German and Swiss machinery and medical equipment manufacturing industries. Managerial service awareness and role understanding, as well as employee service awareness and role understanding seem to be the appropriate triggers to change the behavioural processes in the desired manner. The transition is based on an extended service business, starting with a few product-related services and ending up with a large number of service offerings. Before beginning this process, it should be evaluated how the transition from products to services is influenced by an organisation’s day-to-day activities. A major issue in adopting and implementing a service-led strategy is a firms’ risk aversion. Moreover, people tend to consider problems one at a time, often isolating the current problem from other choices that
may be pending, as well as from future opportunities to make similar decisions. Therefore, it is generally recognised that a broad view of decision problems is an essential requirement for rational decision making. And the broad vision can be shaped with the help of service design representation tools. Gebauer and Friedli (2005) stated that assuming managers identify a lack of structural change to achieve the desired level of service contribution through services, this can be overcome with an investment in human resources applied directly to this area. March and Simon (2005) as cited in Gebauer and Friedli (2005) highlighted that service workers have to manage their reduced time between daily activities and structural change. For successful hybrid offerings, Ulaga and Reinartz (2011) introduce a resource–capability framework to describe the manufacturer-specific resources and capabilities needed. The four critical or unique resources are: (1) product usage and process data derived from the firm’s installed base of physical goods; (2) product development and manufacturing assets; (3) an experienced product sales force and distribution network; (4) a field service organisation. And the five critical or distinctive capabilities are: (1) service-related data processing and interpretation capability; (2) execution risk assessment and mitigation capability; (3) design-to-service capability; (4) hybrid offering sales capability; (5) hybrid offering deployment capability. For smaller manufacturing firms, the recognition of existing capabilities and the new ones required for development represent a major challenge. Service development and delivery have been often described as the orchestration and management of capabilities and resources.

2.2.1 SERVITIZATION AS TRANSFORMATIVE PROCESS

For manufacturing companies willing to approach services, a clear understanding of the concept of service is needed to create an
effective information management system different from the transaction-oriented systems and practices, adjusting services to different cultures, knowing customers’ business contexts and operational conditions. Although the major exemplification of products and services is based on their tangibility and intangibility, other interpretations push towards the integration of these concepts. In the previous paragraphs, servitization has been described not only as a new service development process but for the organizational changes that it implies. Service-oriented strategies, beyond the nature of the outputs, introduce new ways of framing values. Servitization is a transformative process that affects organisations from within, and particularly affects internal management processes. However, what to change and how to change has not been examined in the context of smaller manufacturing firms. In the design literature, it was found that on one side product development can be a vehicle for organisational change (Takeuchi and Nonaka, 1986; Junginger, 2007) and that service design can play a role in the organisational change (Junginger and Sangiorgi, 2009) by encouraging service designers not to embed design in the organisation but to recognise the current design practices within a firm (Junginger, 2014; Junginger, 2015). Organisations face a paradox because they need stability to function well, but they are required to be flexible to survive (Junginger, 2007). It was found that the value-product development successfully improved internal efficiency because it is involves accessing and utilising people’s skills and knowledge as sources for invention and continuous growth. Therefore, internal operations may be closely linked to the overall customer experience they provide. Revolutionary products and organisational transformation both depend on a change in people’s fundamental assumptions. Ulrich and Eppinger [as cited in Junginger (2007)] identified that the steps and activities involved in the product development process are of an intellectual and organisational nature, rather than merely physical ones. A process typically suggests a
predetermined, or at least a predictable, path. For a process to work, one needs to decide the variables and factors that go into producing the desired outcome. The service function is considered as a holistic management concept (Kowalkowski, 2011); the use of services is important to support the business of a project-based firm (Kujala et al., 2013). Gebauer et al. (2011) argue that in the current marketplace competitive advantage can be gained by those firms that begin to offer a service component to their customers; this shift encourages companies to adopt a Service-Dominant Logic for the creation of value propositions to customers (Vargo and Lusch, 2004a). However, Service Dominant Logic requires much more than an increased emphasis on services since it implies a reframing of the firms’ purpose and its role in value co-creation (Kowalkowski, 2010). The richness of word ‘design’ allows a personal definition of service design to fit in, especially when looking at a product, and discovering what makes a product desirable, viable and feasible (Brown, 2009) is a complex process that also involves considering service components. Servitization implies a redefinition of the role of the customer (more demanding, evolution from commodity to experience) and the role of the firm (from product to PSS) in the supply chain. Whether the structure defines the strategy of the firm or not (Neu and Brown, 2005; Junginger and Sangiorgi, 2009) is yet to be investigated.

There is no predefined transition process for service infusion in SMEs that seldom have the resources to build new organisational units or create new specialties. “Instead, they differentiate themselves through new value constellations within business networks. The heterogeneity of service offerings and business networks means those value constellations take many forms” (Kowalkowski et al., 2013). Gummesson (1990) stated that “Activities render services, things render services. The shift in focusing to services is a shift from the means and the producer perspective to the utilization and the customer perspective”. Key findings from Oliva and Kallenberg (2003)
demonstrated that transition occurs in stages (not through leaps) and during each stage, companies have a set of issues to focus on and address them through the development of new capabilities. As value shifts to experiences, the market is becoming a forum for conversation and interactions between consumers, consumer communities, and firms. Existing models in designing services in the literature emphasise the interaction between consumers and firms as the place where value creation happens. Prahalad and Ramaswamy (2004a) dealt with the co-creation of the experience as the next practice in value creation. The service-oriented approach alters the relationship between customers and firms as they both become co-creator of value. Services are relational and temporal by nature (Kimbell, 2011), and require a semantic transformation for products (Clatworthy, 2012). Gebauer et al. (2010) found that service strategy formation and implementation in SMEs depend on their value chain position and the business environment. SMEs often sell through distributors, deliver through installers, and have limited access to their installed-base. The first step is the recognition of services as a lasting differentiation strategy. The alignment is meant in a way that the attributes of strategy, structure and environment are internally consistent, complementary and mutually reinforcing. The relevant organisational elements can be classified into five dimensions: corporate culture; human resource management; organisational structures; measurement and reward systems; and service development process. For a service business to be developed, aspects to consider include: the complexity of market needs, the number of customers, the SMEs' sales model, and competitive differentiation. According to Grönroos and Ojasalo (2004), when dealing with services, inputs are difficult to calculate and outputs are difficult to measure because they imply an interrelationship between productivity, quality, interaction and demand. Services, unlike products, promote a close customer relationships that reveal mutual learning relationships. British Standard (BSI, 1994) provides
information to manage service design at corporate and project level in a mutual development.

2.2.2 DRIVERS AND BARRIERS

Manufacturing companies undertake servitization for the following reasons: financial drivers (e.g. revenue stream and profit margin); strategic drivers (e.g. competitive opportunities and advantage); and marketing drivers (e.g. customer relationships and product differentiation) (Baines et al., 2009). When a firm changes position in the value-stream by moving upstream or downstream, it must develop new capabilities (Davies, 2004). O’Reilly III and Tushman (2004) recommend companies to be ‘ambidextrous’ to remain competitive, which means that managers and executives have to both exploit the present and explore the future. There is a separation between what is new, the exploratory unit, from their traditional, exploitative ones, allowing for different processes, structures and, cultures; they are tightly linked across units at the senior executive level. This is the reason why the business owner plays a key role in making their business more service-oriented. Evidence from successful companies suggests that managers and service workers: accept the risks of the transition (managers are less risk averse); believe in the economic potential of services; encourage employees and establish appropriate processes for extending the service component of the business; free up employees and add service capacity for overcoming the short- and long-term effects of the quality erosion; and conduct second-order changes (Gebauer and Friedli, 2005). According to the findings of companies successful in servitization, Brown et al. (2009) found that they tend to use similar strategies and that manufacturers were inclined to keep services separate. de Brentani (1991) compiled a comprehensive list of determinants for delivering successful service: detailed or formal.
NSD; overall corporate synergy; market competitiveness; product-market fit/attractiveness; expert/people-based service; equipment-based service; service innovativeness; service quality evidence; service newness to the firm; effectiveness of NSD management; service complexity or customisation; quality of service experience; standardisation of service process; market newness to the firm; specialised initial market; responds to demand cycle; market segment adjustment. The success or failure of a firm’s service model is defined by the offering, the funding mechanism, the employee management system, and the customer management system.

Prior studies within manufacturing SMEs (Acklin in Switzerland, Lauren and Salter from the Design Council in the UK, Chesbrough in the USA, Iriarte in the Basque region of Spain, and Ryan in Ireland) show that the first barrier to overcome is to understand the level of awareness of these companies about design and readiness to embrace new innovation processes and the absorption of the concept of service. Services are not add-ons but production systems and social constructions (Morelli, 2009a) and hybrid offering sales are not simply an extension of goods sales (Ulaga and Loveland, 2014). There are some remnants of the manufacturing model to shift from good to service, a discussion between transactional and relational model, and the operand and operant logics (Vargo and Lusch, 2004b). Manufacturing has found solutions to these problems in marketing, production, delivery, product-design, communication, and relationship (Brax, 2005). Services require a different organisational setting than goods; they require motivating the customer to the service co-production; understanding the concept of the service; providing services requires effective information management; transaction-oriented systems and practices are insufficient in managing information about products possessed by customers; customers need support on a continuing basis; unlike most industrial goods, and services need to be adjusted to different cultures. Indeed,
knowing customers’ business contexts and operational conditions is fundamental. In order to provide PSS, Tukker (2004) claims that manufacturing firms have to understand the transition costs as investment. Behavioural implications in servitization (Gebauer et al., 2005) are related to risk aversion of companies when dealing with changes (Kahneman and Lovallo, 1993). According to the willingness to servitize a manufacturing company, the way companies sense and assess risk within the notion of service might be worthy of investigation. The propensity to risk and the degree of openness of smaller manufacturing companies that undertake servitization, is intertwined with the existing firm’s capabilities; the stage the company is in and its evolution; and its exploration and exploitation strategies related to the implementation of services. Simply developing innovative products is unlikely to be sufficient. Woodcock et al. (2000) suggest that unless SMEs can be convinced of the value of data collection as an essential element in learning and improvement, they will forego most of the benefits of that approach as informal networking and any information or competitor analysis gained, tend only to be qualitative and subjective in nature. Limited resources are a common thread among SMEs (Ryan, 2013). Companies undertaking servitization have to overcome the following barriers: increasing service quality and scope might extend the product’s useful life reducing its replacement sales and increasing the quality and durability of products might reduce future service revenues (Oliva and Kallenberg, 2003). To overcome the service paradox, the starting point is to increase the service awareness, accepting the risks of extending the service business and believing in the economic potential of services. Furthermore, as mentioned previously, extending the service business successfully requires various changes in the organisational structure of manufacturing companies (Gebauer et al., 2005). There is also a historic lack of service awareness among managers and employees. So, managers
must carefully plan the implementation of organisational changes to ensure that appropriate goals boost the employee pull effect.

2.2.3 SERVITIZATION AS A MATTER OF FIRMS’ READINESS

Recent studies in servitization show the increasing relevance of the notion of readiness in PSS development. To promote Proteus – a product-service system (PSS) project developed within the Danish maritime industry – Avlonitis et al. (2013) developed one of seven workbooks on PSS readiness. In addition to the organisation’s readiness with its core capabilities, Storbacka and Pennanen (2014) invite managers that are developing solution businesses to consider market readiness too. For instance, Süße (2015), in order to describe the dynamic interplay between production and service within a firm, introduces the notion of improvisation as an organisational design principle and a game-based learning approach. For designing product-service systems, Dewit (2016) presents the front-end conditions that enable the product to service transition. Jansen (2000) discusses the concept of readiness as one of the dynamics for change. Pinpointing this issue will lead to a significant contribution to academia through the better understanding of the alignment of strategy and operations of small manufacturers, how to integrate the service concept into small companies’ business models into their day-to-day routine, and how to address changes in the competitive environment.

Companies build their strategy on past achievements. Each firm has different starting points shaped by learning mechanisms such as practice, codification, mistakes, and pacing (Eisenhardt and Martin, 2000) and path dependency described in terms of routines, assets and strategies developed (Teece, 2007). The attitude of the firm towards innovation is linked to the way it performs as: product innovators, process innovators, and comprehensive innovators.
(Baldwin and Gellatly, 2003a). O’Reilly III and Tushman (2004) advise companies to become ambidextrous organisations with the ability of looking backward but also preparing for future innovations. In servitization, the rate of success is based on three dimensions of business logics: value perspective, service business strategy, and service offering (Löfberg, 2014).

Experience is the result of the configuration of capabilities and codification of new practice-based knowledge of the development team over time. Dynamic capabilities are defined as physical, human and organisational assets (Teece and Pisano, 1994). In servitization, determinants of service quality stem from the comparison between expectations and performance (Parasuraman et al., 1985). Within an organisation, the experience is developed by decision-makers and workers (e.g. the involvement of the owner in the workflow); the technical and management competences; active contribution to the production of products and services; and proximity to the client and local activities (Thomson and Koskinen, 2012).

For companies it is crucial to identify the core competencies derived from capabilities that are strategically valuable to the firm, understanding the relationships between assets (such as physical assets, intellectual assets and cultural assets) and their capabilities (Hafeez et al., 2002). The product development process can be considered as a means for organisational change (Junginger, 2007). When manufacturing firms start recognising potential in service, their offering starts evolving from internal and external stimuli to anticipate or respond to customers’ needs. The boundaries between products and services become blurry, and this increases understanding for the services and also increases the possible sources for innovation (Kindström and Kowalkowski, 2009). The origins and the evolution of the offering are defined by the motivations behind the service development (formal or informal service in place). Starting with product superiority (de Brentani,
competitive advantage is about providing integrated solutions that address a customer's business or operational needs (Davies, 2004) and leveraging on service differentiation (Kowalkowski et al., 2013). But SMEs depend heavily on actors in their business network to achieve success with service infusion (Kowalkowski et al., 2013). Within servitization, the supply chain and non-supply chain relationships are important to identify the role that actors play in the network and the potential co-creation opportunities (Prahalad and Ramaswamy, 2004b; Payne et al., 2008; Chesbrough, 2012). In this respect, both the supplier and customer are value creators (Grönroos, 2011a).

When a firm changes position in the value stream - by moving upstream or downstream - it must develop new capabilities (Davies, 2004). Firms are collections of competencies (Baldwin and Gellatly, 2003a) and social structures (Davies et al., 2006). Knowledge creation is achieved with the types of alignment between service components and development of capabilities (Paiola et al., 2013). In servitization the relevant organisational elements can be classified into five dimensions: corporate culture; human resource management; organizational structures; measurement and reward systems; and service development processes (Gebauer et al., 2010). The motivations to undertake servitization, the staff propensity to explore and test new ideas, the rewards system in place in the firm, and the environment the development team work in, are critical to successful implementation (Eisenhardt and Martin, 2000). In such transition, firms face barriers to overcome risk aversion (Kahneman and Lovallo, 1993), how they cope with uncertainty (Eisenhardt and Martin, 2000), and a lack of recognition of the potential of service and attitude towards the novel and unknown that can hinder or enable the implementation of service.

In the transformation the flow of information of the development process may be affected. Information is exchanged within the
development team and a wider network to assist the decision-making process (Normann and Ramirez, 1993; Payne et al., 2008). A critical element of sensing opportunities for the development of services as a core component of value propositions for the customer, is becoming aware of drivers for change (Ates and Bititci, 2011) and identifying the readiness of the company to move into a service business (Brown et al., 2009; Bailey, 2012).

### 2.3 HETEROGENEITY AMONGST FIRMS

If servitization occurs in stages (Oliva and Kallenberg, 2003), it is not clear if it is different (per se) between large organisations and smaller firms. However, there is no predefined transition process for service infusion in SMEs which seldom have the resources to build new organisational units or create new specialties. Instead, they differentiate themselves through new value constellations within business networks. The heterogeneity of service offerings and business networks means those value constellations take many forms (Kowalkowski et al., 2013). This implies that service infusion is not about choosing what applies to the firm but understanding where the company wants to go (and the capability assessment and challenges to consider). In the servitization discourse, recognising heterogeneity among firms is raising awareness that existing manufacturing firms have distinctive capabilities built over time that are path-dependent (Teece and Pisano, 1994; Eisenhardt and Martin, 2000). They are full of design practices (Junginger, 2015) and for these types of companies to understand what contributes to change and how to implement a service-oriented approach, there is not one-size-fits-all solution. de Brentani (1995) studied new product or service performance and the factors that affect success and failure for different types of firms. Firm size has been recognised to have an impact on how companies function internally and how they respond.
to the marketplace. Different firm sizes mean different combinations of structure, behaviour and strategies of corporate enterprises. Few studies on servitization of manufacturing value the role of the dynamic capabilities deployed by firms that either exploit or explore the opportunities in service development (Fischer et al., 2010). Servitization as a transformative process affects organisations as a whole and not just separate functions, and requires effective management between daily activities and structural change (Bailey, 2012). Although existing studies investigated the strategic and operational implications of the service-oriented approach, qualitative data collected through interviews refer only to the senior-level perspective. Servitization requires a reframing of the purpose of the firm and its role in value co-creation (Kowalkowski, 2010), and implementing services demands an alignment between strategy and operations. Organisations are a social structure (Bartlett and Ghoshal, 1993) and for manufacturing firms undertaking a service-oriented approach, this shift has to be taken into account. Framing servitization as a transformative process for individuals and organisations means understanding what enables them to implement change. That small companies differ from large companies is often highlighted in literature with particular reference to industrial activity. However, the heterogeneity of small companies is rarely emphasised.

In research that aims to create useful output for framing servitization in SMEs, it is worth noting that best practices, skillsets and assets differ from one company to another. The purpose of this research is to help smaller manufacturing companies to start thinking from an inside-out to an outside-in perspective. Welsh and White (1981) asserted that SMEs are not “miniature versions” of large firms. SMEs are regularly recognised as the engine of national economies. However, they are precluded from accessing or effectively utilising service design, as they have neither the resources to engage external consultants nor the knowledge to develop in-house capability.
Berends et al. (2014) state that prior studies found that small firms do not deploy the formalised processes identified as best practice for the management of new product development (NPD) in large firms. Product innovation research should more explicitly differentiate between firms of different sizes, rather than prescribing large firm best practices to small firms (Berends et al., 2014).

2.3.1 FIRM-SPECIFIC CHARACTERISTICS

Beyond a conceptualisation of product and service as bundled or unbundles offerings, Chesbrough (2010) says that SMEs have structural advantages in open innovation compared to large organisations. For instance: size, focus, business specialisation, entrepreneurial persons, and speed. Small companies are encouraged to be potential suppliers, partners or customers for large firms. According to Thomson and Koskinen (2012), the innovation processes of SMEs have an intrinsic nature because they are very different in style and scale from the ones of large companies. Smaller firms are a collection of competences whose determinant of success is based upon involvement in innovative activities (Baldwin and Gellatly, 2003b). The key enablers of business success for SMEs are: internal capacity and capability; the external environment; and the vision of the business owner (BIS, 2013). Changing process is cited as a key enabler for building resilient SMEs (Ates and Bititci, 2011). Although existing capabilities can enable a firm to form new strategies, the same capabilities can create rigidities and inhibit the formation of others (Leonard-Barton (1992) as cited in Neu and Brown (2005)). Active user-innovators and user-manufacturers and companies hold complementary resources (Baldwin et al., 2006): the former possess in-depth knowledge on how to identify and tackle problems, and the latter possess manufacturing capacity, distribution channels, and brands.
The idea of design as a sense-making process has been already discussed and established (Krippendorff, 1989; Kolko, 2010; Kolko, 2011; Dong et al., 2016). The recognition of design as an innovation process of new products and services (Von Hippel, 2005) and the diffusion of innovation within communities (Rogers, 2003) have been widely described. Drawing from the lines above, it is necessary to observe that while invention is seen as a cognitive process, innovation is a social process (Reid and De Brentani, 2004). In this thesis, the application of the design concept within the domain of servitization results in demanding manufacturing companies to face challenges such as reframing companies’ values and shifting their practice from making sense of object(s) to making sense of systems. Paraphrasing Buchanan (1992), the word ‘design’ looks at the solution and the process itself, so that the abilities of professional designers work at two levels: to come up with new ideas, and to plan how to develop and implement ideas to achieve a solution. Despite that the literature presents a multitude of definitions, design conspires to be a meta-competence word with an evolving definition. The design process is described as a distinct creative event; namely, the co-evolution of a problem–solution space. Defining and framing the design problem is therefore a key aspect of creativity (Dorst and Cross, 2001). There is an increasing interest in adopting the core of design thinking and design practices in other fields and for organisational problem solving and innovation (Dorst, 2011). In pinpointing if design is actually different from other disciplines, it was found that the basic reasoning pattern in productive thinking is abduction. In the design literature, the creative design process is often described using abduction (Kolko, 2010; Stewart, 2011; Dong et al., 2016). However, abduction as a strategic thinking and strategic decision-making has also been examined in the business context (Dew, 2007). While Pierce’s work on deduction and induction
as analytical reasoning applied in the context of design help us to predict and explain phenomena in the world, abduction is used in order to create value for others (Dorst, 2011). Design reasoning is a mix of different kinds of thinking, building as it does on induction and problem solving. Particular to the designing disciplines is the ability of investigating themes and creating new frames that can be embedded in the organisation. In the phenomenological method, a ‘theme’ is the experience of meaning. Themes are essentially a sense-making tool, a form of capturing the underlying phenomenon one seeks to understand. One of the aspects to consider for manufacturing firms is the understanding of how design fits into the company. That manufacturing firms are full of design and with design practices has already been discussed (Junginger, 2007; Junginger and Sangiorgi, 2009; Junginger, 2014; Junginger, 2015). Manufacturers and service providers are organisations structured towards product and service in different ways. This suggests that there are different management perspectives. Borja de Mozota (2002) studied the roles of design and competitiveness of 33 SMEs in Europe and found that managers turn to design for reasons such as: product differentiation, launching of a brand, design leadership, the introduction of a new technology, the deterioration of the company image, a drop in sales or margin, a change in top management, or because it is used by competitors. Findings demonstrate that when design has a strategic value in the management of innovation, the design strategy is defined by one of the following categories: a differentiating positioning, a coordinating positioning, or a transforming positioning. Borja de Mozota (2002) observed that design is embedded in the culture of the firm as tacit knowledge or silent design. In the debate between design and management, Borja de Mozota (2006) pointed out that there is a gap between designers and managers because designers lack knowledge of management. Boland et al. (2007) encourage managers to open themselves to the design attitude, and set organisational reward systems to encourage it, so that organisational change comes easier,
is more effective, and reinforces itself over time. To cite Herbert Simon: “the manager is a form-giver who shapes social organizations and economic processes to create value”. In the servitization journey he or she represents a critical element in implementing service-led strategies, particularly within SMEs. The gap between managers’ education and perception of design can be bridged with the adoption of abduction and synthesis methods in practice (Garbuio et al., 2015; Dong et al., 2016). If firms are to recognise the potential of design and manage design thinking and design capabilities within SMEs, they must understand what design is and what it is not (Ward and Dekker, 2009). The concept of design is found to be embedded at different levels as Burns (2009) explored studying the design absorptive capacity within SMEs, while Acklin (2013) contributed to the literature introducing the absorptive design management model tailored for SMEs with little or no prior design experience. In the design value model, design is found to create value for the customer, for the process, for the stakeholders and for the employees (Borja de Mozota, 2006). The reflective practice of design (Schön, 1993), the iterative process of creating and testing hypothesis, attests design as a learning process or knowledge creation process (Evenson and Dubberly, 2011). However, the value of design is not yet fully captured. Probably because solutions, found using the design process, emerge as epiphanies and there are difficulties in explaining how design occurs. Heskett (2009) found that designers are encouraged to situate their work and their value in the current economic system in use, to communicate their value in practice to business managers to help them understand the economic contribution of design. If design is the process and the outcome at the same time, the role of design is to transform the gap into a plan (Ulrich, 2011). The recognition of design as strategy and deployed for strategy, it becomes useful for firms to understand how design fits within their organisation and how they are enabled to inform their own strategy.
In the design literature there is not an established and commonly accepted definition of design. The same is true for service design that is still considered an emergent approach with multiple definitions.

### Definitions of Service Design

<table>
<thead>
<tr>
<th>Source</th>
<th>Definition</th>
</tr>
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<tbody>
<tr>
<td>Service Design Network</td>
<td>Service design is the activity of planning and organizing people, infrastructure, communication and material components of a service in order to improve its quality and the interaction between service provider and customers. The purpose of service design methodologies is to design according to the needs of customers or participants, so that the service is user-friendly, competitive and relevant to the customers.</td>
</tr>
<tr>
<td><a href="http://service-design-network.org/">http://service-design-network.org/</a></td>
<td></td>
</tr>
<tr>
<td>UK Design Council</td>
<td>Service design is all about making the service you deliver useful, usable, efficient, effective and desirable</td>
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<td><a href="http://www.designcouncil.org.uk">http://www.designcouncil.org.uk</a></td>
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<tr>
<td>Engine Service Design</td>
<td>Service design is a design specialism that helps develop and deliver great services. Service design projects improve factors like ease of use, satisfaction, loyalty and efficiency right across areas such as environments, communications and products – and not forgetting the people who deliver the service.</td>
</tr>
<tr>
<td><a href="http://www.enginegroup.co.uk">http://www.enginegroup.co.uk</a></td>
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<td>Live</td>
<td>Work</td>
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<td><a href="http://liveworkstudio.com">http://liveworkstudio.com</a></td>
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<tr>
<td>Within PDR and in the Service Design Programme (2010)</td>
<td>Service design is a creative, viable and user-centred design process that is used by organisations to create value for their customers/users and a competitive advantage for the service provider.</td>
</tr>
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</table>

Table 2-2 Definitions of Service design

In this thesis service design is defined as the process that values the creation of service-based offerings/propositions that result in different configurations of products and services. It can be defined as a global exploration with local interventions making things work effectively and meaningfully in a given context.
“Service Design leverages mapping tools that enable companies to visualise ideas and translate them into practice with the ultimate goal of co-creating and delivering services that support people to accomplish tasks in given contexts and in co-creating value inside and outside firms.”

The purpose of the service design approach is to enable the systemic interactions that occur between artefacts, people and contexts through visual representations to communicate ideas to customers, suppliers and other actors of the network. The creative design is explored through functional visualisation (Taylor, 1969). Beneficial use of visual representation is found in PSS (Morelli and Tollestrup, 2006) whereas new representation techniques for designing are illustrated. The visualisation of the value of service-based offerings has been found to positively affect manufacturing firms in servitization (Kindström et al., 2012). In a business context, Kaplan and Norton (2000) advise firms who have problems with their strategy to map it out. In design, visual representations such as mapping tools, models, frameworks and dashboards offer organisations and individuals a way to frame issues. In contrast with other disciplines, design has a twofold interest in the process and the content as presented in the interaction design research triangle of design practice, design studies, and design exploration (Fallman, 2008). The tension between process and content is in the implementation effort. There are a common set of tools applied by most service design practitioners that include: stakeholder maps (who is involved and their influence), customer journey (what and how the user experiences it), blueprint (how the system works, how the firm interacts with the users) and touchpoints analysis. Particularly, service design emphasises a need to deliver a consistent user experience, aligning the stakeholder network, the system offering, and the staff experience in the front and back office. The business impact of service design is still underestimated (Brand Flu,
Service design is still considered an emergent approach, although it can be accredited to Elena Pacenti who was supervised by Ezio Manzini. Nearly twenty years ago (1998) she received her PhD thesis in Industrial Design entitled “Designing the interaction with services. The contribution of the design culture for service design” from the Polytechnic of Milan. Her thesis represents the starting point of the recognition of service in design research. Service design is a practice-based discipline that observes how people experience a system. In this thesis, the understanding of how the notion of service fits in the design process and practice, is expected to contribute to advance design as a discipline (Secomandi and Snelders, 2013). In investigating how service design consultants operate, Kimbell (2009) found that they pay attention both at macro (service experience) and micro (touchpoints) level; they make a service tangible and visible; they think of the service as a system that consists of artefacts, people and practices. Kimbell (2011) summarised four different approaches to the conceptualization of service design.

![Ways of thinking about service diagram](image)

Figure 2-1 Approaches to service design by Kimbell, 2011

In the service design discipline, service is assumed to be relational and temporal, and most importantly, thought of as value created in
practice. Designing for service is seen as an exploratory process that aims to create a new kind of value relationship between diverse actors within a socio-material configuration. One of the core tasks of service design is the alignment of touch-points to the big picture. Kimbell (2011) highlighted the relevance of a needed orchestration of touchpoints at a local level as well at a systemic level. When undertaking the servitization journey, each business presents a set of expectations in terms of efficiency and performance of the design process to be or change. Clatworthy (2012) suggested a process that transforms a brand strategy into customer experiences during NSD. Further research on the material of service design is suggested (Clatworthy, 2013). Firstly, touchpoints are treated as the central material of service design as well as the service journey. But, time and organisational structure represents other materials for their supportive role as ideational tools. Secomandi and Snelders (2011) argued that the object of service design is to evidence services. Interfaces play the role of making evidence of the service, so that the notion of product and service make them more interconnected and its boundary more blurred. Bailey (2012) focused his research on the learning process and knowledge transfer understanding the factors and conditions when embedding service design in the everyday working practices of the organisation. Behavioural change has been recognised as critical point (Bailey, 2012) to raise awareness of design practices and disseminating design tools and methods through projects and workshops. It is a challenge for a service design team to: manage time and space, workshops by internal staff, encourage and facilitate ideas sharing in multi-disciplinary teams, using common vocabulary and language (with respect to the business language currently being used and bridging the gap between the two, thereby tailoring it to the organisation). Bailey (2012) came up with three hypotheses to have service design embedded in an organisation: (1) Design readiness is crucial for an organisation to absorb design thinking principles and practices; (2) Having an in-house 'design
office' is essential to disseminate design thinking and practices; and, (3) A change in business working practices and organisational behaviour are required to implement design thinking and methods. Two key aspects revealed in his study are: the translation of service design propositions and blueprints into practical projects and the replication of design tools. However, it should be noted that Bailey’s study focussed mainly on public sector organisations. From a design background, Morelli (2006) argued that PSS has rarely been considered in design-related disciplines. His definition of PSS is a social construction that includes people, cultural frame, and technological artefacts. Morelli (2003) believed PSS to be at the intersection of design culture with the practice of service management and development.

2.4.2 SERVICE DESIGN RESEARCH IN SERVITIZATION

To date the application of Service Design has typically been through external service providers (Service Design Consultancies such as ThinkPublic and Engine) or has been limited to multi-national enterprises (Barclays, Virgin, Herman Miller, Philips Design). While such large companies can create design departments with dedicated people to develop new projects, SMEs lack time, people and resources to do the same (Ryan, 2013). As such, the largest section of the economy, Small to Medium Sized Enterprises (SMEs) are precluded from using service design as they have neither the resources to engage external consultants nor the knowledge to develop in-house capability. However, services can play an important part in developing competitive advantage in the contemporary marketplace (Gebauer et al., 2010). In fact, this research explores the impact of the contemporary marketplace on product-producing firms, with a view to proposing service design processes appropriate to the needs of smaller companies. This exploration of the needs of
smaller businesses will be within the context of emergent production technologies due to the likelihood that the user-value derived from such goods will be obtained through a combination of product and service outputs. There is a strong heritage of product design from the manufacturing companies’ point of view. As for the concept of ‘design’, the concept of ‘product’ evolved incorporating service components and becoming a product-service system concept. This not necessarily implies a mandatory transition from products to only services for manufacturing companies. Junginger (2007) refers to a five-year study concluding that product development can serve as the source for creating new organizational core capabilities, particularly technological know-how which, in turn, can renew the corporate enterprise machine. Therefore, the product development process reflects its potential as a transformative tool for managers if well embedded and implemented into the organisation. To make the organisation and its products work for them, organisations need to foster change around their experience - from the outside in. The organisation can be seen as a catalyst of human-centred product development. It can be a strategy for generating and implementing internal changes to create new paths of interaction for customers and employees, where the four elements are: people, structures, resources, and purpose. Manufacturers are full of design (thinking, practices and methods) and organisational design legacies are in place (Junginger, 2015). Despite the studies focussing on the product development process, the approach used can be borrowed to create a system strategy as Junginger highlighted the fact that the path to finding a solution is a matter of strategy and internal organisation. There is a changed role of design in manufacturing: one cannot design services as products, and companies have to be encouraged to start designing services with the same attention as products (Polaine et al., 2013). However, this does not imply that the process is the same. When talking about instilling a human perspective in the organisation, it means to recognise individuals’ skillset and enable
people to accomplish their goals. For enabling solutions to be developed, enabling platforms must be created to encourage people to participate (Manzini and Vezzoli, 2003). This approach should be considered at **MACRO** level when dealing with the way daily activities are accomplished but also at **micro** level when managing a single project. In exploring the overlaps and differences in service dominant logic and design thinking, Wetter Edman (2009) highlights that the two integrative approaches have the creation of value and the importance of understanding the users or customers in common, in the sense that while service dominant logic describes and prescribes and design thinking interprets and visualises. There has been little exploration of manufacturing SMEs from a service design perspective (Sangiorgi et al., 2012; Iriarte et al., 2014) despite this class of company representing the largest section of the economy (BIS, 2013). It is important to break down the barriers for novel collaborations and consider value at the centre; a conscious and parallel evolution of the understanding of service, design and users (Sangiorgi et al., 2012; Sangiorgi et al., 2016). From a closer perspective to service design, Sangiorgi et al. (2012) developed a series of workshops to support manufacturing companies in their move toward services. They were based on namely: the role of service thinking in product-orientated SMEs; customer-centred innovation; service development and action planning. Findings from these workshops revealed that companies need a more focused approach to their business as before selling services they have to sell this approach internally, and this requires raising the awareness of the service within the company. The research thesis of Clatworthy (2013) widely describes how he alternated more or less active roles during the workshop sessions. This obviously raises some questions such as the ownership of the project, the fact of influencing others’ activity, and the social dynamics within co-design and co-creation.
Although, it was found that the use of the structured process facilitated the sharing of different points of view within the firm in a structured approach where all could participate, this was developed and tested with two firms and its applicability and generalisability to other scenarios is unclear. Within manufacturing firms undertaking transition, it is suggested that design professionals cover a broader role as strategic partners in the entire servitization transition and in overcoming the key challenges to its effective implementation (Calabretta et al., 2016). Investigating drivers and barriers of using service design for the development of services provides a significant contribution to academia through the better understanding of the operations of small producers and how they address changes in a competitive environment. Above all, this research will contribute to practice by providing new strategies for service generation and servitization in small companies. For practitioners, this research has implication for shaping platforms and presents a new set of capabilities on how to develop a product-service system under time and resource constraints typical of small organisations.

2.5 TOOLS FOR SERVITIZATION

A limited number of studies have investigated the implications of services within smaller manufacturing companies, and among them, just few from a service design perspective (Sangiorgi et al., 2012; Iriarte et al., 2014; Sangiorgi et al., 2016; West and Di Nardo, 2016). It is reasonable to assume that small company operations differ from those of larger companies. Therefore it is unlikely that the finding of studies on companies such as Xerox, Alstom and Rolls Royce (Baines and Lightfoot, 2013a) can simply be transferred to a small company context.

Existing models and frameworks are based on large organisations’ experience and how they dealt with the transition toward a service-
oriented mindset (Mathieu, 2001b; Oliva and Kallenberg, 2003; Davies, 2004; Brax, 2005; Gebauer et al., 2005; Gebauer and Friedli, 2005; Davies et al., 2006; Kindström and Kowalkowski, 2009).

However, a limited number of studies on smaller manufacturing companies (Gebauer et al., 2010; Paiola et al., 2012; Kowalkowski et al., 2013; Ulaga and Loveland, 2014) show that on one side a servitization pathway occurs in a similar way to that of large companies, and on the other side it presents different complexities that are beyond their size (Paiola et al., 2013). The abovementioned studies present descriptive models that although they are useful in illustrating different options in PSS, they do not offer companies a way to orientate themselves in one path or the other. Smaller companies are not smaller versions of larger ones (Welsh and White, 1981). At the time of writing, the literature does not offer models and frameworks that look at assessing servitization from a smaller firm perspective across its functions as a whole. Although drivers and barriers have been discussed separately, the purpose of existing tools is not to offer manufacturing firms a way to raise awareness of the nature of the change each company has to face.

Through a systematic review of value constellations from low to high levels of servitization, Brax and Visintin (2016) identified the following categories of the existing models: end-state models; gradual transition models; and, stepwise progression models. While the end-state models look at the outcome of servitization; gradual transition models identify the activities as incremental transition; and, stepwise progression models identify sequential and transformational steps in servitization. In this study, models and frameworks of the literature are clustered as follows: configurations of offerings (that can be applied to the service history dimension); options of integration in the supply chain (linked to the external engagement dimension), and organisational barriers to overcome (firm-dependant relationships among dimensions). However, existing
studies do not currently offer smaller firms a tool to evaluate and choose which path to follow based on company history, identity, and structure as a whole.

First of all, the notion of service challenges manufacturing companies not only in raising awareness in the operations activities in which personnel are asked to possess both relational and technical skills (Mathieu, 2001a), but most importantly in the strategic decisions that the managing director has to take; supporting and sharing his willingness to ‘serve’ customers over time and moving away from a transactional-type of relationship with them. Although Oliva and Kallenberg (2003) claim for creating PSS continuum, they introduced a developmental approach based on capabilities. It can assist firms to shift the nature of the relationship with the product’s end-users and the focus of the service offering. In order to do that, Oliva and Kallenberg claim it is necessary to consolidate product-related services; begin offering services to support product sales; extend to relationship-based services or expand to process-centred services and finally manage operations that were originally managed by the end user. However, this transition requires that three successive hurdles are overcome: believing in the economic potential of the service component for their product; perceiving whether or not providing services is beyond the scope of their competencies; and deciding to enter that market but then failing to deploying a successful service strategy for internal or external problems. Firms have to be aware of the cultural change to become service-oriented; value services, how to sell, deliver and bill them. Although literature (Gebauer et al., 2005; Brown et al., 2009; Kowalkowski, 2010; Paiola et al., 2012; Kastalli et al., 2013) suggests manufacturing firms create a separate organization to handle the service offering, it is not clear if and how smaller companies can afford it. Service-led growth demands a better understanding of the customers in context and this requires understanding behavioural and organisational aspects,
motivations to extend the service business and commitment of service workers (Gebauer et al., 2005; Gebauer and Friedli, 2005). For manufacturing firms to maximize the success of these behavioural processes, Gebauer and Friedli (2005) introduced the following four key managerial implications: (1) to establish a “value-added” managerial service awareness; (2) change managerial role understanding – from traditional customer support to business manager; (3) establish a “value-added” employee service awareness; (4) change employee role understanding – from selling products to providing services. The identified characteristics of behavioural processes within successful and unsuccessful companies are: risk aversion (highly risk averse/less risk averse); economic potential of services (do not believe in the economic potential/do believe in the economic potential); fundamental attribution error (just pushing employees to extend the service business/balance of encouraging employees and of establishing structures and processes to extend the service business); setting up structures and processes (do not overcome the negative short and long-term effects of the quality erosion/freeing employees and adding service capacity overcoming the negative short and long-term effects); first- and second-order changes (overemphasis on obvious and tangible features of the environment and sunk costs fallacy leading to first order changes/second-order changes); employee perception of the transition (no employee-pull effect/employee pull arises); management objectives (excessively ambitious objectives leading to a credibility gap/adequate objectives avoiding the credibility gap).

The literature offers fragmented view of phenomenon and more integration is needed to frame servitization as transformative/organizational change, guidance on looking at the firm as a whole fine-tuning and aligning of strategic and operational decisions to take.
Previous models overlooked managing directors and senior staff perspectives with limited attention to the operations/shop floor level perception of servitization. In another study Gebauer et al. (2005) suggest that for firms to establish a market-oriented and service-oriented process, understanding the change of the managerial role is fundamental to initiate relationship marketing. Defining a clear service strategy and considering establishing a separate service organisation is required to finally create a service culture. Combining the business environments and value chain positions (complexity of market needs; the number of customers; SMEs’ sales model; and competitive differentiation) results in four different service responses to specific combinations of value chain position and business environment: (A) suppliers selling to few customers; (B) suppliers selling to distributors; (C) OEMs selling to few customers; and (D) OEMs selling to distributors (Gebauer et al., 2010). Paiola et al. (2013) introduced four distinct strategic approaches addressing the service components and the development of capabilities: (1) “selling after-sales services”; (2) “integrating after-sales solutions”; (3) “selling life-cycle solutions”; (4) “orchestrating total solutions”. Here, again, smaller firms have the option to understand how servitization occurs but they are not given tools to understand the one that fits them.

Looking at servitization from the sales force point of view, Ulaga and Loveland (2014) developed a resource-capability framework. They uncovered four major transition issues discussed with C-suite managers: (1) the magnitude of change at the sales organisation level triggered by a service transformation; (2) unique elements of selling hybrid offerings versus industrial goods; (3) the link between these differences and the sales proficiencies required for hybrid offering sales; and, (4) potential individual differences among high-performing hybrid offering salespeople compared with sales representatives focused on goods sales. With the spiral process for
PSS, Pezzotta et al. (2012) identified six task regions: Customer Communication (tasks required to establish effective communication between the development team, customers and other stakeholders); Planning (tasks required to define resources, timelines, and other project related information); Risk Analysis (tasks required to assess both technical and management risks); Engineering (tasks required to build one or more representations of the application); Construction and Release (tasks required to construct, test, install, and provide user support); Customer Evaluation (tasks required to obtain customer feedback based on the evaluation of the solution representations created during the engineering stage and implemented during the installation stage). However, Pezzotta et al. identified four criteria as relevant for the design and development of a product-service system: the level of integration of product and service; the level of involvement of all the lifecycle phases in the engineering process (i.e. Beginning Of Life (BOL), Middle Of Life (MOL) and End Of Life (EOL)); the level of involvement of all the competencies required to offer and deliver PSS solutions (involvement of different functions and of the actors of the value chain); and the level of involvement of the customer in the co-creation of value.

In different ways, the models presented above raise and bridge some of the issues in the servitization transition. Critical aspects in the transitions are: the creation of the offering in terms of integration of product and services (internal alignment, can a smaller company create a separate office to manage services?); integration with suppliers and customer proximity (realignment of the internal roles); and, the notion of service absorption. Existing models in the literature describe how successful manufacturing companies moved away from pure product-based to an integrated approach in their offering in a retrospective way (Finne et al., 2013). Most of the previous studies are of large manufacturing companies and the results of those studies
helped the researcher to frame what servitization is and put in the context of smaller manufacturers. Literature offers top-down interventions to support managers with general guidance on successful and unsuccessful factors of implementation. Outcomes of successful companies lead smaller manufacturers to look back at their drivers and to distil how they overcome barriers. Paradoxes in servitization literature show on one end the awareness of the potential of services and on the other end that a failure in implementing the steps may stem from the lack of understanding of where to go based on what the firm is or has in terms of skillset. A general assessment of what they are to understand, where to go, and how to operationalise actions is required. For manufacturing companies open to service orientation, Löfberg (2014) claims for consistency between the three dimensions of business logics: value perspective, service business strategy, and service offering. However, service manoeuvres are necessary to overcome this challenge: changing employees’ mind-sets; starting to value services; and separating products and services. For Brax (2005) the paradox is that, although perceived as more secure, becoming a service-focused business by broadening the total offering with services is challenging, because services are in conflict with the transaction orientation. Hence, becoming a provider of industrial services is not just a matter of the offering; the whole organisation needs to re-focus its attention. Where firms lack understanding of the potential of developing service and the steps to take, it is unlikely for them to achieve success (de Brentani, 1991; de Brentani, 1995; Gebauer et al., 2005). Ates and Bititci (2011) point out that for building resilient SMEs the key enabler is change management process capability because, based on their findings, those firms seem to focus mainly on operational, hard and internal aspects of change management with a short-term, reactive behaviour, whilst neglecting strategic, long-term and soft requirements of the organisational change process. Open innovation in SMEs has a great potential (Chesbrough, 2010), as has having
access to lead users (Von Hippel, 2005). Managing design in SMEs is complicated and as it needs to be understood what design is and is not (Ward and Dekker, 2009). Hence, the design absorptive capacity of SMEs (Burns, 2009) and the absorptive design management model (Acklin, 2010; Acklin, 2013) have to be investigated to understand what companies need in terms of tools and methods to integrate a design mindset and become service-oriented.

2.6 RESEARCH QUESTIONS

The scope of the thematic literature review stems from the need to obtain an overview of the servitization phenomenon. Research articles were grouped in themes in order to understand how the transition from product-oriented to service-oriented happens, what do manufacturers and service providers do and discovering the boundaries and overlap between products and services. The focus on successful cases, drivers and barriers, and, the examination of existing tools to implement service-oriented changes within manufacturing firms led to further investigation of the concept of heterogeneity (firm-specific characteristics) and the concept of readiness.

The figure below describes the development of this research from the focus on general themes of servitization to a more granular understanding of this phenomenon.
At the end of the literature review, it became clear that further investigation was needed on the organizational aspects of the firm as a whole, not just focusing on a new service development process for product-oriented firms, but identifying factors that enable companies to undertake the servitization journey. While large organizations present different structures, access to resources and different capabilities, SMEs need further support to understand the nature of change and the implementation steps to take. Themes revealed from the literature review provided helpful information on the topics to discuss with the companies in the first questionnaire.
A structured literature review at the outset of the study revealed that little had been written on the issue of servitization within smaller firms. For manufacturers willing to undertake the servitization journey, a categorisation of product-service system (PSS) is not enough to guide companies in this transition. There are gaps relating to how products and services are related to each other in the development process. Tools and toolkits to develop services are already available, but less is known on how firms manage the transition to service-oriented strategies and implement change. Much of the available literature is based on larger firms neglecting to frame how smaller manufacturing firms undertake servitization and start implementing service-led strategies to develop PSS offerings. In order to understand the nature of servitization as an organisational and transformational phenomenon, the review of the literature showed a gap on smaller companies that are willing to undertake servitization journey. Further exploration is needed to understand how smaller companies are internally organised to create value, their decisions-making processes and their structure. The process for servitisation in the smaller firm is likely to be quite different to that of larger organisations. In servitization literature, the concept of readiness for developing and offering product-service systems includes concepts such as a firm’s awareness and commitment to implement service. The concept of readiness represents a way to describe the move into service business, similar to the way product development can be considered a vehicle for organisational change, as a catalyst to bring change in the organisation (Takeuchi and Nonaka, 1986; Junginger, 2007). Service innovation can be explored as a vehicle for framing established product-oriented businesses to move away from goods production and start integrating services in their offerings. The literature on service design has a strong focus on public sector and although some tools and findings can be shared, they do not necessarily apply to manufacturing. This thesis helps to frame the role of service design in servitization by understanding the
design tools that value visualisation to describe and explain connections, relationships and interpretations in the creation and development of systems of product(s) and service(s).

According to the overall aim of this thesis, which is to understand the servitization phenomenon, the following research questions aim to investigate the factors that impact product-oriented firms that are involved in undertaking servitization at strategic and operational levels. The first question deals with the identification of the factors that enable smaller manufacturing companies develop services. The second looks at how companies are related to the identified factors. The third question investigates if the framework can be considered an assessment tool. Answering the previous questions will lead to the configuration of the tool as an assessment tool for companies.

**RQ1** What factors are important for enabling the development of services in smaller manufacturing companies?

**RQ2** How might company experience and capability in relation to these factors be identified?

**RQ3** Can this understanding be configured as an assessment tool for companies?
3 METHODOLOGY

This chapter outlines the philosophical premise, strategy, and detailed design of the research undertaken. Alternative research approaches are described and the selected methods are justified in terms of their relevance to the aims and objectives of the thesis.

3.1 RESEARCH PHILOSOPHY

Drawing from the gaps found in the literature and the lack of studies of servitization from the service design discipline, the purpose of this research was exploratory. This approach addressed the need to understand how companies might assess readiness to implement a more values-based service design approach when creating PSS offers. Due to the limited number of studies on servitization of small manufacturing companies, this research evaluated the contribution of service design thinking in framing and supporting the transition from product to service in small companies in the early stages of development of the servitization journey.

3.1.1 ONTOLOGICAL AND EPISTEMOLOGICAL PERSPECTIVES IN RESEARCH

The ontological and epistemological perspectives of the researcher influence how research is designed and carried out. The assumptions underpinning the research philosophy informed the research strategy in terms of the nature of data to collect and the reflection upon those data. Ontology is the researcher’s world view. There are two main ontological positions: objectivism and subjectivism or constructionism (Saunders et al., 2012). Objectivism is based on the assumption that social phenomena and their meanings are independent of social actors. Conversely, constructionism asserts that social phenomena
are created from the perceptions and consequent actions of social actors. Epistemology is concerned with how knowledge is built and acquired from the external world. Relevant epistemological positions for this research are presented in table 3.1 to allow the reader to understand the choices made in this thesis. Saunders et al. (2012) describe the following main epistemologies: positivism, realism, interpretivism and pragmatism.
<table>
<thead>
<tr>
<th><strong>Ontological assumptions</strong></th>
<th><strong>PRAGMATISM</strong></th>
<th><strong>POSITIVISM</strong></th>
<th><strong>REALISM</strong></th>
<th><strong>INTERPRETIVISM</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>External, multiple, view chosen to best enable answering of research question</td>
<td>External, objective and independent of social actors</td>
<td>Is objective. Exists independently of human thoughts and beliefs or knowledge of their existence (realist), but it interpreted through social conditioning (critical realist)</td>
<td>Socially constructed, subjective, may change, multiple</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Epistemological assumptions</strong></th>
<th><strong>PRAGMATISM</strong></th>
<th><strong>POSITIVISM</strong></th>
<th><strong>REALISM</strong></th>
<th><strong>INTERPRETIVISM</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Either or both observable phenomena and subjective meanings can provide acceptable knowledge dependent upon the research question. Focus on practical applied research, integrating different perspectives to help interpret the data</td>
<td>Only observable phenomena can provide credible data, facts. Focus on causality and law-like generalizations, reducing phenomena to simplest elements.</td>
<td>Observable phenomena provide credible data, facts. Insufficient data means inaccuracies in sensations (direct realism). Alternatively, phenomena create sensations which are open to misinterpretation (critical realism). Focus on explaining within a context or contexts.</td>
<td>Subjective meanings and social phenomena. Focus upon the details of situation, a reality behind these details, subjective meanings motivating actions.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Axiology</strong></th>
<th><strong>PRAGMATISM</strong></th>
<th><strong>POSITIVISM</strong></th>
<th><strong>REALISM</strong></th>
<th><strong>INTERPRETIVISM</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Values play a large role in interpreting results, the researcher adopting both objective and subjective points of view</td>
<td>Research is undertaken in a value-free way, the researcher is independent of the data and maintains an objective stance</td>
<td>Research is valued; the researcher is biased by world views, cultural experiences, and upbringing. These will impact on the research</td>
<td>Research is value bound, the researcher is part of what is being researched, cannot be separated and so will be subjective</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Data collection techniques most often used</strong></th>
<th><strong>PRAGMATISM</strong></th>
<th><strong>POSITIVISM</strong></th>
<th><strong>REALISM</strong></th>
<th><strong>INTERPRETIVISM</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed or multiple method designs, quantitative and qualitative</td>
<td>Highly structured, large samples, measurement, quantitative, but can use qualitative</td>
<td>Methods chosen must fit the subject matter, quantitative or qualitative</td>
<td>Small samples, in-depth investigations, qualitative</td>
<td></td>
</tr>
</tbody>
</table>

Table 3-1 Research philosophies, Saunders et al., 2012.
For pragmatists, the importance of the meaning of an idea (or research finding) is in its practical consequences. Concepts are only relevant where they support action. The epistemological perspective of positivism is disjoint from the social actors who have no roles in the construction of knowledge. What is objectively observable is considered valid knowledge. In realism, although it attests that the real world exists independently from the social actors, the experience of the world is through social actors that offer different interpretations to the observable and intangible of the world. Amongst the epistemological perspective presented above, only interpretivism considers the multiplicity of realities that are filtered and determined by actors whose generalisation is considered meaningless beyond context. Based on the ontological and epistemological perspectives of positivism, the starting point is from abstract theories, building operational hypotheses considering quantitative, directly observable and measurable data. In realism, ongoing cycles between observation and theory in the form of quantitative and qualitative data, are used to build new knowledge. Differently, from the approaches above, the interpretivist approach starts with inductions, continuing with reflection and then constructing abstract concepts leveraging qualitative type of data (Blaikie, 2000). The exploratory nature of this research and the research questions formulated at the end of the literature review suggest interpretivism as the approach that better fits with the intent of this thesis to describe and understand firms’ motives to undertake the servitization journey. Drawing from table 3.1 on the different epistemological perspectives, it is useful to explain how cycles of enquiry occur in research.
In deepening understanding on the most suitable epistemological perspective for this thesis, a comparison amongst three types of inference reasoning to carry out and create knowledge is presented below. Saunders et al. (2012) present the following research approaches, namely: deduction, induction, and abduction (table 3.2 below).

<table>
<thead>
<tr>
<th>Logic</th>
<th>Deduction</th>
<th>Induction</th>
<th>Abduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In a deductive inference, when the premises are true, the conclusion must also be true</td>
<td>In an inductive inference, known premises are used to generate untested conclusions</td>
<td>In an abductive inference, known premises are used to generate testable conclusions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Representation of the logic</th>
<th>A --------- &gt; C</th>
<th>A --------- &gt; C</th>
<th>A --------- &gt; C</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Generalisability</th>
<th>Generalising from the general to the specific</th>
<th>Generalising from the specific to the general</th>
<th>Generalising from the interactions between the specific and the general</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Use of data</th>
<th>Data collection is used to evaluate propositions or hypotheses related to an existing theory</th>
<th>Data collection is used to explore a phenomenon, identify themes and patterns and create a conceptual framework</th>
<th>Data collection is used to explore a phenomenon, identify themes and patterns, locate these in a conceptual framework and test this through subsequent data collection and so forth</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Theory</th>
<th>Theory falsification or verification</th>
<th>Theory generation and building</th>
<th>Theory generation or modification; incorporating existing theory where appropriate, to build new theory or modify existing theory</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Conclusion</th>
<th>synthesis</th>
<th>analysis, thesis</th>
<th>abstraction, hypothesis</th>
</tr>
</thead>
</table>

Table 3-2 Deduction, induction, abduction: research approaches (adapted from Saunders et. al., 2012)

Deductive reasoning, widely used in scientific research, concerns the evolution of a theory that is then tested through a series of propositions. The deductive research approach looks at the causal
relationships between concepts and variable. It tends to prefer operationalisation of quantitative data through a structured methodology to enable replication and allowing generalisation of the sample. In induction, which has its origins in social sciences, to better understand the nature of the problem and making sense of the interview data, the analysis would result in a formulation of a theory in the form of a conceptual framework. Induction asserts to generate theory following data, considering the relevant role of context and the advantage of having a small sample to study. Within the abductive research domain, data collection aims to explore a phenomenon, to identify themes and patterns, to locate these in a conceptual framework and test this through subsequent data collection. Therefore, the theory is formed and modified on the basis of existing theory. In describing the characteristics of the different logics, Blaikie (2000) illustrates inductive, deductive and abductive introducing retroductive reasoning (table 3.3).

<table>
<thead>
<tr>
<th>Inductive</th>
<th>Deductive</th>
<th>Retrophic</th>
<th>Abductive</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aim</strong></td>
<td>To establish universal generalisations to be used as pattern explanations</td>
<td>To test theories to eliminate false ones and corroborate the survivor</td>
<td>To discover underlying mechanisms to explain observed regularities</td>
</tr>
<tr>
<td><strong>From</strong></td>
<td>Accumulate observations or data</td>
<td>Borrow or construct a theory and express it as an argument</td>
<td>Document and model a regularity</td>
</tr>
<tr>
<td></td>
<td>Produce generalisations</td>
<td>Deduce hypotheses</td>
<td>Construct a hypothetical model of a mechanism</td>
</tr>
<tr>
<td><strong>To</strong></td>
<td>Use these ‘laws’ as patterns to explain further observations</td>
<td>Test the hypotheses by matching them with data</td>
<td>Find the real mechanism by observation and/or experiment</td>
</tr>
</tbody>
</table>

Table 3-3 The logic of four research approaches Blaikie (2000) p. 101

Induction and abduction classify empirical facts, but only abduction can discover relevant premises and act as a problem-solving strategy.
It is worth noting that the research approaches are not exclusive in their deployment, but researchers have the opportunity to adopt them as integrative and complementary approaches. Hence, the nature of this research demanded a new integrative research approach between inductive and abduction that stemmed from the design background of the researcher. Although the abductive approach has had limited use in social sciences, this approach is widely used in design practice.

3.1.3 QUALITATIVE VS. QUANTITATIVE ASSUMPTIONS

Quantitative and qualitative research is distinguished in terms of data collection techniques, the output generated and data analysis procedures. Although quantitative and qualitative methods are generally associated with positivism and interpretivism respectively, they are often depicted as two opponent methodologies. However, the deployment of multiple methods is widely used. In line with the research philosophy, research conducted quantitatively is usually associated with a deductive approach where data is used to test the theory, to examine relationships among variables numerically and follow a standard procedure to allow another researcher to replicate the research using experiments or surveys. In addition, according to the specific research goals devised, mixed methods are used to allow the integration of open-ended questions to be analysed qualitatively with questionnaires that can then be quantitatively analysed.

Qualitative research is usually associated with interpretative philosophy because the researcher plays a role in making sense of subjective and socially constructed meanings. It usually starts with an inductive approach; however, abduction is used to develop and test inferences iteratively (Saunders et al., 2012). Qualitative research values the access to participants’ point of view and their construction of meanings. Hence, data collection procedures are usually based on
interviews whereas data collected can be analysed objectively treating data as objects (e.g. repetition of words and concepts) or depicting emergent relationships between themes and participants (e.g. link between a topic and position of the respondent in the company) within a given context. Rubin and Rubin (2011) illustrate two philosophies of research: positivist and naturalist or constructionist. The former relies on the assumption that there is a single objective reality that is fixed and directly measurable and quantifiable; while the constructionist approach frames reality as constantly changing and can be constructed through the interpretations of people. Constructionists use observation, questioning, and description as means to understand the world around them as opposed to positivists’ measuring and counting. Positivist researchers assume that respondents understand the meaning of their questions in an identical way and test their hypotheses taking a neutral role. Instead, constructionists expect interviewees have different frames of reference and try to describe and explain a complex situation or process as it is. In qualitative studies, researchers are active participants whose personalities, knowledge, curiosity, and sensitivity all impact the quality of the work. The purpose of positivists is to test theories, and they often design their research based on concepts and themes others have introduced.

Conversely, constructionist researchers read the literature very differently, looking for engaging topics, unanswered questions, disagreements between authors, or social problems that need investigation. They aim to learn which elements of a complex environment affected what was seen or heard. Corbin and Strauss (2008) argue that for a qualitative researcher to do good analysis, he or she has to be able to "step into the shoes of participants and feel "gut level", otherwise you lose some of the richness and depth of the data". Design is valued for its user centricity from the early
phases, to the development and testing phases. Designers take user’s perspective throughout the whole process. Drawing from the nature of the research questions, the interpretivist philosophy has already been discussed and considered the most suitable for this investigation. Hence, a suitable methodology based on the collection of qualitative and contextual data is preferred for investigating servitization within smaller firms. Qualitative research focuses on framing and understanding not coded practices and behaviors to interpret phenomenon, as Silverman (2013) states: "the beauty of qualitative research is that gives you access to the nitty-gritty reality of everyday life viewed through a new analytic lens". For that reason, a quantitative approach was considered unsuitable to address the research questions.

Denzin and Lincoln (2011) as cited in Creswell (2013) consider:

"Qualitative research as a situated activity that locates the observer in the world. It consists of a set of interpretive, material practices that makes the world visible. These practices transform the world. They turn the world into a series of representations, including field notes, interviews, conversations, photographs, recordings, and memos to the self."

Supporting this approach, Creswell (2013) provides a neat description of what qualitative research means to him: "I think metaphorically of qualitative research as an intricate fabric composed of minute threads, many colors, different textures, and various blends of material". The richness of details provided by qualitative research originates from looking at "qualitative data come in the form of words rather than numbers" [Miles and Huberman (1984) as cited in Silverman (2013)]. For Silverman (2013) doing qualitative research consists of data collection, analysis and writing: activities that are virtually inseparable. "If social reality is regarded as the product of processes by which social actors together negotiate the meanings for actions and situations (Blaikie, 2000), interpretivism is concerned with understanding the social world people have produced and which
they reproduce through their continuing activities”. Hence, in order to investigate servitization in small companies, an interpretivist approach was taken to frame how companies (organisations and social structures, down to people at the individual level) give meaning to the “actions that lead to patterns”.

3.1.4 RESEARCH POSITION FOR THIS STUDY

The research position taken in the thesis valued the personal interaction with respondents to investigate the servitization journey of smaller manufacturing firm within the philosophical domain of interpretivism, taking an integrative approach to induction and abduction of a small sample of firms in a longitudinal study. The review of the literature offered interpretations of servitization that were filtered from the information that the researcher can access based on his or her point of access in the field (Brax and Visintin, 2016). Servitization does not seem to be a predefined transition process for small manufacturing companies, therefore if ‘any way goes’ (Kowalkowski et al., 2013), this suggested that there is no unique and objective reality, but the enquiry is built through people’s experience. Considering technology as socially constructed (Blaikie, 2000; Bijker et al., 2012), to uncover and explain the servitization issues, it was crucial to understand how owners and employees of the selected firms interpret what surrounds them, their values and priorities, their hands-on tasks and what they focused on day to day. Hence, constructionism is the theoretical approach that reflects the rationale behind this research. This qualitative research was intended to discover new themes and new explanations to describe how the servitization process is implied in relational, organisational and social terms. Qualitative data were generated by the social context and taking this interpretivist position the methods of analysis produce rich, nuanced and detailed data (Mason, 2002). Building on the
ontological and epistemological assumptions of this study, an initial inductive approach was taken to analyse data from previous studies and produce generalisations on the key themes to start understanding how manufacturing firms recognised their readiness in servitization. However, in the primary research phases, an inductive approach investigated participating companies’ motives for exploring service design further. Subsequently, drawing from the abductive approach, data analysed informed the framework. To reinforce this point, the abductive approach encouraged a reflection in order to discover the meanings and theories (Blaikie, 2000). The rationale behind this research was to interpret the absorption notions of design and service. In order to do that, a large sample size did not allow the researcher to develop an in-depth investigation. Since the servitization phenomenon comprises internal and external aspects/drivers and barriers informed by the context, the intent of this research was to address the research questions in investigating factors of readiness in undertaking the servitization journey.

3.2 RESEARCH STRATEGY

When formulating the research strategy, the researcher is offered a set of data collection techniques and data analysis procedures such as experiment and survey; archival research; case study; ethnography; action research; grounded theory; and, narrative enquiry. The first two techniques are usually associated with deductive research and are not considered contributing in this exploratory research. Qualitative research is associated with an interpretive philosophy (Denzin and Lincoln, 2011), in order to make sense of how individuals socially construct their reality, to gain an in-depth understanding of the meanings and the relationships between them. Starting from an inductive approach at the outset of the research to orientate and familiarise with the topic and understand what has already been done
and tested, it was considered appropriate to have face-to-face interaction with managing directors to visit in their own factories. In the identification of the most suitable method to answer the research questions and building on the objectives of this research, an overview of the alternatives is described in the following section.

### 3.2.1 ALTERNATIVES

In order to identify the most suitable way to answer the research questions at the end of the literature review chapter, a comparison amongst five methodological approaches (Creswell, 2013) is provided: narratives, phenomenologies, grounded theory, ethnography, and case study. Table 3.4 below presents the five research strategies.
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Narrative research</th>
<th>Phenomenology</th>
<th>Grounded theory</th>
<th>Ethnography</th>
<th>Case study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus</td>
<td>Exploring the life of an individual</td>
<td>Understanding the essence of the experience</td>
<td>Developing a theory grounded in data from the field</td>
<td>Describing and interpreting a culture-sharing group</td>
<td>Developing an in-depth description and analysis of a case or multiple cases</td>
</tr>
<tr>
<td>Type of problem best suited for design</td>
<td>Needing to tell stories of individual experiences</td>
<td>Needing to describe the essence of a lived phenomenon</td>
<td>Grounding a theory in the views of participants</td>
<td>Describing and interpreting the shared patterns of culture of a group</td>
<td>Providing an in-depth understanding of a case or cases</td>
</tr>
<tr>
<td>Discipline background</td>
<td>Drawing from the humanities including anthropology, literature, history, psychology, and sociology</td>
<td>Drawing from philosophy, psychology, and education</td>
<td>Drawing from sociology</td>
<td>Drawing from anthropology and sociology</td>
<td>Drawing from psychology, law, political science, and medicine</td>
</tr>
<tr>
<td>Unit of analysis</td>
<td>Studying one or more individuals</td>
<td>Studying several individuals who have shared the experience</td>
<td>Studying a process, an action, or an interaction involving many individuals</td>
<td>Studying a group that shares the same culture</td>
<td>Studying an event, a program, an activity, or more than one individual</td>
</tr>
<tr>
<td>Data collection forms</td>
<td>Using primarily interviews and documents</td>
<td>Using primarily interviews with individuals, although documents, observations, and art may also be considered</td>
<td>Using primarily interviews with 20-60 individuals</td>
<td>Using primarily observations and interviews, but perhaps collecting other sources during extended time in field</td>
<td>Using multiple sources, such as interviews, observations, documents, and artifacts</td>
</tr>
<tr>
<td>Data analysis strategies</td>
<td>Analysing data for stories, “restorying” stories, and developing themes, often using a chronology</td>
<td>Analysing data for significant statements, meaning units, textual and structural description, and description of the “essence”</td>
<td>Analysing data through open coding, axial coding, and selective coding</td>
<td>Analysing data through description of the culture-sharing group and themes about the group</td>
<td>Analysing data through description of the case and themes of the case as well as cross-case themes</td>
</tr>
<tr>
<td>Written report</td>
<td>Developing a narrative about the stories of an individual’s life</td>
<td>Describing the “essence” of the experience</td>
<td>Generating a theory illustrated in a figure</td>
<td>Describing how a culture-sharing group works</td>
<td>Developing a detailed analysis of one or more cases</td>
</tr>
<tr>
<td>Research procedures (a narrative, significance of individual, data collection, analysis outcomes)</td>
<td>Report of stories</td>
<td>Individuals theorise about their lives</td>
<td>Narrative segments identified</td>
<td>Patterns of meaning identified (events, processes, epiphanies, themes)</td>
<td>Summary (adapted from Denzin, 1989a, 1989b)</td>
</tr>
<tr>
<td>Research procedures (a phenomenology and philosophical assumptions, data collection, analysis outcomes)</td>
<td>Significant statements</td>
<td>Meanings of statements</td>
<td>Themes of meanings</td>
<td>Exhaustive description of phenomenon (adapted from Moustakas, 1994)</td>
<td></td>
</tr>
<tr>
<td>Research procedures (grounded theory, data collection, analysis, outcomes)</td>
<td>Open coding</td>
<td>Axial coding</td>
<td>Selective coding and theoretical propositions and models</td>
<td>Discussion of theory and contrasts with extant literature (adapted from Strauss &amp; Corbin, 1990)</td>
<td></td>
</tr>
<tr>
<td>Research procedures (ethnography, data collection, analysis, outcomes)</td>
<td>Description of culture</td>
<td>Analysis of cultural themes</td>
<td>Interpretation, lessons learned, and questions raised (adapted from Wolkott, 1994b)</td>
<td>(problem, questions, case study, data collection, analysis, outcomes)</td>
<td>Description of the case/cases and its/their context</td>
</tr>
</tbody>
</table>

Table 3-4 'Contrasting characteristics of five qualitative approaches' (adapted from Creswell, 2013)
Drawing from the research philosophy position, the comparison of the five qualitative research approaches above was essential in the identification of the most suitable approach to address the research questions. Narrative research focuses on the experience of one or more individuals, searching for patterns and themes to chronologically develop a story. While phenomenology studies the essence of the experience using interviews and other means. From the researcher perspective, the characteristics above did not fully fit with the exploratory purpose of this thesis. In pinpointing advantages and disadvantages amongst the most suitable research strategy, on one hand grounded theory develops a theory grounded in data from the field based on studying a process, an action, or an interaction involving many individuals. Data comprise interviews that are analysed through coding. Because of the uncertainty in the resulting theoretical contribution, using grounded theory was not considered suitable to explore this topic because its data analysis strategies were considered too rigid. Drawing from anthropology and sociology, ethnography studies a group that shares the same culture, describing and interpreting the shared patterns. It makes use of observations and interviews and other sources collected over an extended period of time in the field. The ultimate aim is to create a report on how a culture-sharing group works. In the design practice, the ethnographic approach is widely used (Kimbell, 2011) because data are collected in the field and with the aim to describe and interpret a culture-sharing group. This strategy requires commitment and availability of firms. Case study research is based on detailed analysis of an event, a program or an activity using multiple sources, such as interviews, observations, documents, and artefacts to providing in-depth understanding of one or more cases, themes and cross-case themes. It is drawn from psychology, law, political science, and medicine. Drawing from the overview of methodological approaches and methods in qualitative research literature and examples of existing studies, case study was initially considered as the most suitable
means of enquiry to describe activities and derive categories and concepts. To gain a deeper understanding of what doing qualitative research means and using case study as the strategy of enquiry, a twofold definition of case study has been provided by Yin (2013).

First, a case study is an empirical enquiry that:

"Investigates a contemporary phenomenon (the “case”) in depth and within its real-world context, especially when; the boundaries between phenomenon and context may not be clearly evident"

Second, a case study enquiry:

"Copes with technically distinctive situation in which there will be many more variables of interest than data points, and as one result; relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result; benefits from the prior development of theoretical propositions to guide data collection and analysis"

The case study aims to produce in-depth investigation of single or multiple cases. It studies an activity collecting data through multiple sources. The critical point is the generalisation of case studies since results are limited to the investigated cases. The overview of research strategies shows that there are different alternatives that the researcher had to consider in light of the topic to investigate and the output to generate. Creswell (2013) suggests defining the expected result to inform the strategy of enquiry. In this research, it was proposed to develop a conceptual framework for small manufacturing companies to understand their readiness to extend their offerings to services. It had to take into account drivers and barriers in the transition and size-dependent characteristics. Drawing from the characteristics of the qualitative research approaches described above, grounded theory and ethnography as strategies of enquiry do not fit the purpose of this study. On one hand, grounded theory results in theory building generated from data gathered in the field, based on participants’ view, but the exploratory nature of this study
would not justify the creation of new theory at this stage. On the other hand, ethnography requires an amount of time to spend in the field to look for patterns in interviews and observation that then inform a written report. Although companies are willing to engage with researchers, they have busy schedules and limited time.

The outcome of case study is based on in-depth investigation of one or more cases focusing on an activity, which in this case is the servitization phenomenon. Schramm (1971) as reported by (Yin, 2013) values case study as follows: “The essence of a case study, the central tendency among all types of case study, is that it tries to illuminate a decision or a set of decisions: why they were taken, how they were implemented, and with what result”. And the research questions examined internal and external motivations of small firms in undertaking servitization upon which they build their service development processes. More broadly, the innovation development process is a decision-making journey where the choices made at the very front end hugely impact the outcome (Reid and De Brentani, 2004; Clatworthy, 2011). Formulating questions to investigate recent events allows researchers “to focus on a ‘case’ and retain a holistic and real-world perspective” (Yin, 2013). Different strategies address different forms of research questions. According to the following five methods namely experiment, survey, archival analysis, history and case study, they all ask ‘what’ questions. However, case study focuses on contemporary events and aims to answer ‘how’ and ‘why’ questions. In this exploratory study, the research questions formulated at the end of the literature review chapter are based on how and why questions. However, case study differs from fieldwork as ethnography or participant-observation because of the use of multiple sources to gain information about the activities, the context, and the issues related to it. Case study aims to generate in-depth analysis with more detail, richness, completeness, and variance of the individual unit of study and the setting of its boundaries (Denzin and
Lincoln, 2011). The selection criteria contribute to the transferability. “The case study’s unique strength is its ability to deal with a full variety of evidence: documents, artefacts, interviews and observation” Yin (2013). Based on the results of the review of the literature and the fact that some tools fit better with some projects more than with others, the main tools that reflected the beneficial effects encouraged an exchange between the firm and outside. For instance, in the MEPSS project van Halen et al. (2005) developed a toolkit to guide companies in the process of developing and implementing a successful and sustainable product-service system presenting three case studies. Each case study presents a configuration of tools attempting to address the issues within the company under study. In another study, Goedkoop et al. (1999) presented 10 case studies on Product-Service Systems, including ecological and economic aspects. This report provides an assessment of the economic and environmental relevance of Product Service Systems and their suitability and value in the context of the Dutch environmental policy. It investigates the value of PSS as a general concept for unlinking economic growth and environmental impact. Morelli (2009b) presented the TeleCentra project on designing temporary offices for nomadic workers. In Proteus (booklet #2 case) the development of PSS concepts entail many of the activities applied the in general development of technical products, but also some new ways of working and approaching the value creation process. Based on these definitions of case study, the current servitization process of small manufacturing firms is an under-investigated phenomenon as Paiola et al. (2013) confirm because the way smaller firms manage the transition from product to services is still poorly understood. Based on the practicalities of access and exploratory aspects (lack of ready access to company documents but multiple points of contact, using multiple research instruments - see Appendices C, D and E) and in acknowledging that design cases do not fully meet the Yin criteria, to answer this problem a multiple ‘design case’ approach was
adopted. Design strategy as reflection in practice has been adopted to develop tools to collect data and build the design cases. Single case data are analysed, triangulated and compared among the other cases. Despite some limitations on the generalisation of data and the number of cases involved, the research questions led the researcher to choose design cases as a strategy of enquiry. This was a more observational research approach that developed ‘design cases’ over time through a series of interviews to apply tools to evaluate the impact, applicability and usefulness of the framework. The research questions were based on ‘how’, ‘what’ and ‘why’ questions which aim to identify insights on participants behaviour as a development group. Moreover, previous research in this area (Mathieu, 2001a; Oliva and Kallenberg, 2003; Brax, 2005; Gebauer et al., 2010; Kowalkowski, 2011) tended to prefer a qualitative approach to investigate the servitization phenomenon. Baines et al. (2009) pointed out that papers are mainly descriptive and “there are no examples of more prescriptive approaches using techniques such as action research”. Emerging research from other theses in servitization often adopted case study as a strategy of enquiry.

3.2.2 DESIGN CASES

Denzin and Lincoln (2011) present five misunderstandings of case study. In the first one they claim that general, theoretical knowledge is more valuable than concrete case knowledge. In the second they argue that one cannot generalise on the basis of an individual case; therefore, the case study cannot contribute to scientific development. The third misunderstanding is that the case study is most useful for generating hypothesis; that is, in the first stage of a total research process, while other methods are more suitable for hypotheses testing and theory building. In the fourth, the case study contains a bias toward verification; a tendency to confirm the researcher’s
preconceived notions. In the fifth it is often difficult to summarise and develop general propositions and theories on the basis of specific case studies. Aware of the research context and the constraints or limitations of the methods, the case study-type approach to the design cases was chosen to best represent the servitization phenomenon as it occurs in small companies. Despite the case study approach being initially considered a suitable option to present data, in practice it presented some limitations in terms of output to produce. Therefore, building on the five misunderstandings of the case study and the nature of the research questions of this study, the research strategy was ‘design cases’ to differentiate them from the traditional case study as described by Yin (2013). The current study intended to evaluate which are the factors upon which small manufacturing firms evolve their value propositions moving away from product-based offerings. In light of the social, economic, technologic and digital context, servitization phenomenon demands a strategy of enquiry that investigates the firm-specific characteristics that drive or hinder the firm in this transition. Schön (1993) describes the reflection-in-action as characterised with iteration and reflection phases that occur in practice in the design process. In bridging design practice and design strategy Dorst (2016) states that academic design has a dual nature: “it can be seen as the use of theory for the framing of a real world problem when we look from the side of practice, while from the side of academia, it can be seen as a design experiment that has been derived from academic thoughts and discussions, translated into potential (experimental) action”.

By definition, traditional case study is an investigation of contemporary phenomenon in depth and within its real-world context. In this study, design cases differentiate from traditional case studies because the results of data analysis contribute first to the creation and refinement of a framework and the creation of companies’
profiles with tailored recommendations based on respondents’ perspective.

### 3.2.3 DESIGN CASES’ SELECTION STRATEGIES

In this research, samples and cases were not randomly selected but information-oriented in order to reach a variation of cases (Denzin and Lincoln, 2011). They introduce strategies for the selection of samples and cases. The design case selection process was based according to the purpose of the study. Among the types of selection described by Denzin and Lincoln (2011) (random selection; random sample; stratified sample; information-oriented selection; extreme/deviant cases; maximum variation cases; critical cases; and, paradigmatic cases), for this study the information-oriented selection was used to **maximize the utility of information from small samples and single cases**. Cases are selected on the basis of expectations about their information content. In order to answer the research questions, the following set of criteria were used to select companies:

- Manufacturing firms must already be aware of Service Design;
- Participating companies must be perceived as stable and have established design process procedures;
- They must have demonstrated some interest in growth through the development of services or use of service design;
- Geographically accessible and willing to entertain regular visits from the research team.

Service Design knowledge is a key criterion in companies’ selection because it shows that firms have already started to be involved in activities that consider service as strategic asset when undertaking servitization with an understanding of related tools and techniques. In 2010, PDR promoted the Service Design programme, a Welsh
government supported programme to introduce service design to manufacturers. External help was provided to train non-designers to outsource design work or to develop in-house capabilities. Firms interested in understanding designing services can be found amongst the participants companies of that programme. Ninety companies engaged with the Service Design Programme and demonstrated a commitment to service innovation through internal investment (PDR project description available on [http://pdronline.co.uk/Portfolio/the-service-design-programme](http://pdronline.co.uk/Portfolio/the-service-design-programme)). In order to create meaningful impact on a business, it was important that the programme engaged with companies over a long period of time. The shift from products to services that service design can exploit is as much about change management as it is about design. Some of the 90 were interested in being engaged over a long period of time, two cases were developed: one of them is a SME and the other a larger organization.

3.3 RESEARCH DESIGN

Based upon the research questions detailed in the previous section, primary data were collected through in-depth semi-structured interviews over a span of one year engaging with each firm three to four times. Audio was recorded, interviews were transcribed and analysed using Nvivo. Secondary data were collected through firms’ websites, organisational documents provided by the owner-manager, paper and digital brochures and previous presentations and documents developed during the Service Design programme. Interviews were undertaken using a semi-structured questionnaire designed to enable an understanding of the design process and organisational aspects. The questions were created to allow the respondents to elicit issues and new emerging topics such as design process, concept of service, personal beliefs and barriers in service-led approaches, his or her involvement in strategic and operational
METHODOLOGY

tasks. Data were used to induce qualitative dimensions and develop the conceptual framework.

3.3.1 INTERNAL PILOT

An internal preliminary design case was carried out to examine the feasibility of the first version of the intervention mechanism to test and revise the questions prepared. Within PDR, there is a research group that operate in a quasi-autonomous fashion, providing commercial products and services (typically to hospitals). This group (Surgical and Prosthetic Design) that constantly interacts with doctors and patients, was selected for pilot for the following reasons: geographical proximity and the nature of their offering. Although it is a small group within the research centre where the researcher is based, by its nature it can be considered like a small business unit. In preparation for data collection, questions relevant to real-world cases were asked to gain conceptual clarification of the method to be applied to the other cases (Yin, 2013). As the design cases were intended to be built on a series of interviews, the pilot provided time-based and interview process practice (McCracken, 1988).

3.3.2 PHASES

Following the internal pilot, a leaflet to introduce the researcher and her current research topic was produced to leave with companies (see appendix C). It consisted of a paper-based document (an A4 folded brochure) with information on the research study, the research centre affiliated to the university, the researcher, the involvement of the company on one side and on the other side a diagram with perceived drivers and barriers to complete along three axes: culture, technology and organisation. It was intended as means to start engaging with
companies and to increase the level of interaction at the outset of the research (see appendix C). Themes and gaps found in the literature informed research strategy to collect, to analyse data, and to share results with the participant firms. Figure 3.1 below shows the three phases involving the participating companies the design cases were built on.

Figure 3-1 Data collection phases

3.3.2.1 EXPLORING - DATA COLLECTION PROCESS

Building on the themes found in the literature review (figure 2.2), figure 3.2 below represents the steps taken to develop the introductory questionnaire.

Figure 3-2 From the literature review to the data collection

According to the research questions, this research investigates the notion of service within small companies, how those manufacturing
companies convey meaning to a PSS process and how to integrate a product-service system that best fits with their firm’s vision. The number of interviews is not set a priori. It depends from the depth and variation of information achieved (Corbin and Strauss, 2008). The purpose is to explore firms’ point of view on servitization in terms of configuration of the development team, how value is created within the company and the service notion internally shared and the value proposition externally promoted.

In the first phase “Exploring” in order to gain an overview of how the development processes work within the case companies, the owner was the main candidate for the interviews. Face-to-face semi-structured interviews were set up, comprising of 18 questions grouped into 6 sections, namely: general background information; the development process and people involved; the configuration of the offering; and service perception. The questionnaire (available in the appendix C) focuses on the internal activities and dynamics within the development team, how decisions are made in the development process, and how integrated offerings are perceived and developed.

### 3.3.3 DATA ANALYSIS

Each interview recorded was manually transcribed by the researcher, systematically coded using the software Nvivo to inductively discover the important themes, and these themes cross-referenced with the literature. This enabled the creation of a framework for understanding readiness. The diagram on the back of the leaflet titled *Exploring barriers and drivers in servitization* was also scanned and coded. Taking a reflection-in-action approach, phases of analysis and synthesis alternated. The first analysis was planned after the first introductory interview that informed the first set of themes. In fact, firms’ path-dependent information highlighted the need to explore how companies perceive themselves and how they could explore their
perception using a reflective tool. For Silverman (2013) “early data analysis has a further advantage: it allows you to reconsider the direction in which your research is heading”.

The depth and richness of the answers of the questionnaire informed the first version of the Readiness Framework, a framework to assess readiness of smaller companies to deploy services as part of their competitive strategy. In this way, a selection of common themes emerge including sub-themes and further questions to explore more deeply and gather further information from respondents (McCracken, 1988).

The second data collection phase of the interviews at board level and operational level resulted from the deployment of the readiness framework. The analysis followed a plan for coding. A process for implementing the framework with companies was developed, consisting of sets of three questions for each of the nine dimensions (presented in Chapter 4). These questions explored intensity, state of adoption, and frequency of activities related to the nine dimensions. In this phase the readiness framework was tested both at board level and at shop-floor level. To check internal consistency, each interview concluded asking the respondents for feedback on the terminology, the content discussed and the framework itself.

3.3.3.1 ANALYSIS AND OUTCOMES – PRESENTING THE RESULTS

In the third phase ‘Analysis and outcomes’ company profiles were created and results were presented to add further validation to the framework. A report based on each company’s results was given. A copy of the three reports based on the results of each company is available in the appendix. The contribution of each firm lies in advancing the understanding of the topic making changes in the way
3.4 RESEARCH EXECUTION

In the first phase of this research, opportunities arose to meet other companies to discuss drivers, barriers and opportunities in servitization. Although not formally part of the research design, they enabled greater understanding of the service development phenomena in smaller companies. Table 3.5 below introduces the three companies interviewed for this thesis.

<table>
<thead>
<tr>
<th>Companies overview</th>
<th>Company A</th>
<th>Company B</th>
<th>Company C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering</td>
<td>Energy efficient ventilation solutions</td>
<td>Electro-chemical water treatment</td>
<td>Special purpose machines and automations systems</td>
</tr>
</tbody>
</table>
Company A is a manufacturing firm that offers energy efficient ventilation solutions. The Marketing Director and the Operations Director were interviewed.

Company B produces electro-chemical water treatment plants. The Managing Director and representatives of the workshop took part to the research.

Company C is a special purpose machines and automations systems manufacturer. The Managing Director and the workshop supervisor were involved in this study.

Figure 3.3 below describes the three data collection phases and the engagement with the three participating companies.
3.4.1 DATA COLLECTION PROCEDURES

After the internal pilot, the companies willing to participate to this research were contacted and an introductory meeting was arranged with the owner or the managing director. The purpose of interviewing senior/board level staff stems from the need to have an overview of the company and a broad understanding of how the firm works. Longitudinal multiple design cases of selected firms that show interest and willingness in exploring service design, provided a good variance of information and data that, although not fully generalisable, advance the servitization discourse. Themes and notions discussed in the semi-structured interviews provided qualitative data based on firm-specific experiences in the servitization journey.

3.4.2 ETHICAL CONSIDERATION

All research adheres to Cardiff Metropolitan University research ethics procedures. Ethics approval was sought prior to the start of the primary data collection activity. Participants were fully informed of the scope and purpose of the research; involvement was entirely voluntary and, all participants were offered anonymity. Written consent was obtained to record audio during the meetings. A copy of the information sheet and ethics/consent form is available in the Appendix A.

3.5 METHODOLOGICAL LIMITATIONS (PERCEIVED)

It should be noted that a priori limitations of manufacturing SMEs interested in servitization and with previous knowledge in service design is extremely limited. This shows a limited availability of SMEs meeting the selection criteria in section 3.2.3. Valuing the willingness and availability of companies meeting the aforementioned selection
criteria, this study also invited companies that were larger than SMEs that presented previous knowledge on service design and similar characteristics to small manufacturing firms to participate in this exploratory research.
4 DEVELOPING THE READINESS FRAMEWORK

This chapter demonstrates how the results of phase 1 of the research resulted in the creation of a conceptual readiness framework. Previous research offers little direction on implementation strategy to undertake servitization, thus the rationale behind the readiness framework is to help manufacturing firms understand how ready they are to change; to describe motivations and factors that contribute to organisational change; and to drive the company from a former state of traditional manufacturer to a servitized firm. The readiness framework takes into account the legacy of manufacturing that stems from established product-oriented design processes.

4.1 RESULTS PHASE 1 - EXPLORING COMPANY A

In the introductory meeting, Company A introduced itself, their core offering and their structure as a product company that offers energy efficient ventilation solutions (table 4.1 below).

<table>
<thead>
<tr>
<th>COMPANY A’s profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering</td>
</tr>
<tr>
<td>Source of innovation</td>
</tr>
<tr>
<td>Development team</td>
</tr>
<tr>
<td>Company statement</td>
</tr>
<tr>
<td>Quotes</td>
</tr>
</tbody>
</table>

The Marketing Director claims they are a manufacturing company that includes three departments: engineering, marketing and sales.
These departments are grouped according to three streams, namely residential, commercial and international. Based on the previous involvement with the Service Design Programme, the Marketing Director of Company A sees service design as not just for designing a new service. At the same time, he sees manufacturing like an activity that is not just for making one thing in one place.

Company A identifies itself as a product-focused firm. In the preliminary interview with the Marketing Director, he stated the following:

- **99% of revenues from products and services are created alongside the products; we don’t sell services: no installation, after-sales care.**
- **The percentage of product and service components describes the level of assets and resources the company has to develop the solution to be** (when he looked at the framework).
- **The product-service balance is quite important because we don’t have to become a service company.**
- **You can’t lose track of what you are good at!**
- **We have used the service tools to help and have better product development not to get a service development.**
- **Who are your customers? Who buys? Who chooses? Who specifies? Who gets the delivery? They are different in different places.**
- **(We have a) Strong focus on financials, quickest reward because it brings more revenues quicker (compared to services). It’s all about profitability!**

During the introductory interview, the Marketing Director was asked to complete the Drivers and barriers diagram (figure 4.1) on the back of the research leaflet (see appendix C), the issues of servitization were verbally discussed and reported along the three axes drawn.
from the literature review (Morelli, 2002): culture, organisation and technology.

Figure 4-1 Scan of the leaflet drivers and barriers of Company A
In the previous page, Figure 4.1 shows the notes of the Marketing Director on the perceived issues, drivers and barriers when approaching services. Following the order of the notes as listed in the interview, he started from culture as “the ability to see products and services together”. He said that culture has to be “able to change, to be agile and change process” to adapt. Organization is considered as “customer-focused”; the “voice of customer” is important and it is encouraged by “informal meetings”. For what concerns technology, it is important to “understand legislation, cost and interest (of people)” to sense the acceptance of technology into the market (“people ability to be up-to-date with technology”). It is also a matter of cost versus technology.

### 4.2 RESULTS PHASE 1 - EXPLORING COMPANY B

Table 4.2 below briefly describes Company B: its core offering, the structure of the development process, its identity and perception towards servitization.

<table>
<thead>
<tr>
<th>COMPANY B’s profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering</td>
</tr>
<tr>
<td>Source of innovation</td>
</tr>
<tr>
<td>Development team</td>
</tr>
<tr>
<td>Company statement</td>
</tr>
<tr>
<td>Quotes</td>
</tr>
</tbody>
</table>

Company B showed a strong identity as a product-focused firm. The preliminary interview with the CEO focussed on the following:
• Strong focus on prototypes to show (e.g. visualization models) and demonstrate they work (e.g. “feel the vibrations through the machine”).

• Iteration of prototypes (now from digital ones and physical ones).

• Context and how to overcome problems (e.g. remote control now).

• Past achievements (e.g. previous works)

• How to sell: word of mouth (reputation of successful past projects).

• Focus on scale-up/growth (where you can add/lose margin, utility market).

• Service component (e.g. mechanical as maintenance and remote control software)

During the introductory interview, the CEO and the Operations Director were asked to complete the drivers and barriers diagram on the back of the research leaflet (see appendix C). In this case, the issues of servitization were verbally discussed along the three axes drawn from the literature review (Morelli, 2002): culture, organisation and technology. Although no written notes were included in the Driver and barriers diagram on the back of the leaflet, the conversation centring on the issues of servitization was audio recorded, transcribed and analysed. The CEO of Company B started discussing the importance of culture, because the manager director has the responsibility to build the organisation around culture. Firms have to know their customers and technology to innovate. The Operations Director said that technology adapts a lot faster than culture. Often, firms have to deal with very conservative bodies such as the utility market, which have a conservative culture and are slow
to innovate. There are lot of barriers in terms of risk aversion for these bodies in terms of adopting new solutions. The Operations Director stated that the emphasis is in making technology so sophisticated that it makes it easier for people to adopt (e.g. interfaces) through the power of creativity, so that: “people can just log in and say it works!”. Company B is currently looking for larger companies who specialise in supporting technology for a system integrator having access to power water technology.

4.3 RESULTS PHASE 1 - EXPLORING COMPANY C

Table 4.3 below briefly describes Company C: its core offering, the structure of the development process, its identity and perception towards servitization.

**COMPANY C’s profile C**

<table>
<thead>
<tr>
<th>Offering</th>
<th>Special purpose machines and automation systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source of innovation</td>
<td>‘Every project is a launch’</td>
</tr>
<tr>
<td></td>
<td>No explicit creative sources</td>
</tr>
<tr>
<td>Development team</td>
<td>MD, Project team of engineers and head of workshop</td>
</tr>
<tr>
<td>Company statement</td>
<td>‘We work in a dynamic environment with high levels of flexibility and technology’</td>
</tr>
<tr>
<td>Quotes</td>
<td>Quality, cost and delivery</td>
</tr>
</tbody>
</table>

Table 4-3 Company C’s profile

Company C showed a strong identity as a product-focused firm. During the introductory interview, the Managing Director was asked to complete the drivers and barriers diagram on the back of the research leaflet (see appendix C). In this case, the issues of servitization were verbally discussed along the three axes drawn from the literature review (Morelli, 2002): culture, organisation and technology. Although no written notes of the respondent were
included in the driver and barriers diagram on the back of the leaflet, the conversation triggered by the issues of servitization was recorded, transcribed and analysed. In answering which were the biggest barriers to overcome when implementing services, the Managing Director of Company C listed them as follows: organisation, culture, and technology. He did not consider technology as a barrier to his firm. He stated that “it’s all about these people”. He recently started a form of organisational learning to look at individuals and groups within the organisation. He focuses on the following elements to improve his firm: personal transformation, self-awareness, knowledge, and learning about yourself. He considers important to look at people at an organisational level: the integration and understanding of yourself and the organisational concepts; systems; and measurements. He encourages critical thinking and states that training by itself is not useful to deepen knowledge. He is currently studying behavioural change, and the transformation and meta-abilities of his employees.

4.4 SUMMARY PHASE 1 - EXPLORING COMPANIES

During phase 1 - Exploring, Company A, B and C showed a strong identity and legacy on making. They have an increasing awareness in the service potential/contribution of product-service system value proposition. The table 4.4 below summarizes data collected in the first interviews.

<table>
<thead>
<tr>
<th>Data from the interviews (firms’ perspective)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMEs vs. large organizations</td>
</tr>
<tr>
<td>Good internal communication (Company B)</td>
</tr>
<tr>
<td>Less need of formalizing reward and incentive systems (Company B)</td>
</tr>
</tbody>
</table>
Table 4-4 Summary results phase 1

Based on the literature review, answers were initially grouped in the following themes: SMEs vs. large organizations; manufacturers vs. service providers; and, heterogeneity amongst firms.

In the first column of table 4.4, differences among companies are characterized for: the good internal communication (Company B); the less need of formalising reward and incentive systems (Company B); the flexibility and attitude towards novelty or new technology (Company B and C); the growth ambition of SMEs and target settings (Company B and C); and the difficult access to funding (Company B).

In the second column, manufacturers are defined as different from service providers for: the identity and legacy on making (Company A, B and C); the awareness of prototypes in exploring, testing ideas and showing that they work (Company A, B and C); the codification of knowledge and high levels of tacit knowledge on making or apprenticeship (Company C); the close network (roles, forces and
influences of suppliers and competitors in Company A and B); the focus on operational aspects and technical expertise (Company B and C); and, the limited customer-facing staff (no scripts for services) (Company B and C). To conclude, firms differ from each other for the level of formalisation of the development process (Company A and C); the configuration and skill set of the development team (Company A, B and C); the internal set of values and priorities (Company B and C); the company culture and development towards innovation, engagement of employees, selection and validation of ideas (Company A and B); and, the vision of the future (Company A, B and C). Figure 4.2 describe the topics discussed with the companies in the first questionnaire, the resulting themes grouped in macro category and new themes and sub-themes emerged.

<table>
<thead>
<tr>
<th>Interviews topics</th>
<th>Themes from interview outcomes</th>
<th>Subthemes from interview outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>General company information</td>
<td>Identity and legacy on making</td>
<td>Context and path dependence Challenges</td>
</tr>
<tr>
<td>Being a small company</td>
<td>Service awareness</td>
<td>Management Performance criteria Rate of success</td>
</tr>
<tr>
<td>Design &amp; Business strategy</td>
<td></td>
<td>Formulation of the development process</td>
</tr>
<tr>
<td>Design process Development process and people involved</td>
<td></td>
<td>Development team: background, configuration of the competencies Existing capabilities</td>
</tr>
<tr>
<td>Routine activities</td>
<td></td>
<td>Nature of the firm’s offering</td>
</tr>
<tr>
<td>Configuration of the offering</td>
<td></td>
<td>Origins of the revenues</td>
</tr>
<tr>
<td>Service perception</td>
<td></td>
<td>Supply-chain relationships</td>
</tr>
</tbody>
</table>

Figure 4-2 From the first interviews to the creation of the framework
4.5 ORIGINS OF THE READINESS FRAMEWORK

As a result of the phase 1 (figure 3.3 in the Methodology Chapter), preliminary results based on the managers’ perspective were grouped as follows:

- Identity and legacy on making (“Fabricating at a slow pace to stop and think”)
- Service awareness (“Manufacturing is not just making one thing in one place”)
- Service design making (“Service design is not only designing a new service”)

From the first findings, it became clear that servitization is more than simply adding services but rather requires a deep understanding of motivations and potential benefits. Bailey (2012) pointed out that design readiness is one of the factors to embed design within companies. The analysis of the first set of data led to finding a link between the notions of design and service in order to understand how design is used within manufacturing companies, and the maturity of design within companies and the way they access and use design is evidently different (as represented in the Danish Design ladder, 2003). This research seeks to link design maturity to service development (e.g. the types of PSS introduced by Tukker (2004)). In terms of service design, there are different levels of integration of design and service at the same time that describe each manufacturing company. The readiness framework responds to the need of assisting manufacturing companies in organisational change with the identification and assessment of the factors that influence such change. Drawing from the literature and as a result of the preliminary interviews, the deployment of the readiness framework directly contributed to answering the research questions. The nine dimensions of the readiness framework have been identified to
describe firms’ identity and activities and offers tailored recommendations of organisational practices to plan for change.

4.6 PURPOSE OF THE FRAMEWORK

The readiness framework is an assessment tool intended to assist companies in recognising the opportunities for undertaking the servitization journey. It explores motivations and expectations in adopting design and services, firm’s position in the supply chain, the internal structure of the organisation and, how value propositions are created and promoted. It assesses the level of readiness along nine dimensions that have been identified as prerequisites for manufacturing firms to make the transition from product-based to service-oriented offerings.

This framework is based on the development of new understanding on what might motivate firms to engage with service development and the barriers they face in achieving their ambitions, framing the challenges at organisational level with the alignment of strategic and operational levels. In the literature design and service concepts within manufacturing are still scarcely discussed in the service design research community. This research aims to bridge contributions from marketing, service management and engineering. At the time of writing, servitization literature presents a maturity model (Pigosso and McAloone, 2016) that is different in purpose from the approach presented in this thesis because it aims to evaluate the environmental performance in PSS. It is important to state that each model recognises that good quality product is the basis for integrated value propositions to deliver, and focuses on the early stages of the development process. The readiness framework has been developed as a way to frame a business embracing the vision of the future of the company that assesses itself starting from what made the firm and considering what it has become over the years. To the world of
service design research, this is the product of a new understanding to help committed manufacturing companies have a better idea of what might motivate them to undertake servitization. In this thesis, the role of design does not offer tools to operationalise servitization, but the results of the research look at the cultural change project within the organisation. The readiness framework as an assessment tool is intended to raise awareness in companies to understand drivers and barriers from product to service and how ready they are to plan and achieve a better strategic and operational alignment.

From a service design perspective, the readiness framework merges the concepts of design process, design practice and service value. In PSS creation within manufacturing companies the purpose of service design tools is the identification of users’ needs. Methods to collect qualitative data include: customer journey, stakeholder maps, personas and blueprint. The deployment of these operative tools requires the development of design sensibilities to allow manufacturing firms to turn data into useful information to support their strategy, and to share and align firms’ visions.

4.7 FRAMEWORK’S DIMENSIONS

The readiness framework (figure 4.2) enables different levels of understanding of how people with different roles in the same firm see themselves in the servitization journey along the nine dimensions. In order to have an overview of the company, the effectiveness dimension is explored through a conversation that describes past achievements, successful products or services that made the firm what it had become. A discussion on the lessons learnt inform the experience dimension that sets out how knowledge has been codified. The service history dimensions looks at the evolution of offering reflecting on the changes in the configuration of competences to offer the current value propositions. As the offering evolves, the external
engagement of the firm adapts accordingly. The working and learning environment affects the way culture and development is managed; sources of innovation and independent ways creativity takes place and, generally, the attitude towards novelty and the risk propensity related to change. Communication plays a huge role in circulating formal and informal information within the company that then will create a shared vision of the future in raising awareness on the service value and the customer-oriented approach to instil in new value proposition to create.

Figure 4-3 The readiness framework with the nine dimensions
4.8 ORIGINS OF THE DIMENSIONS

The literature review resulted in the identification of the main issues in servitization, and the investigation of these topics informed the first set of semi-structured interviews. The interviews of three companies have been fully transcribed and systematically analysed using Nvivo. The coding of the interviews resulted in a number of recurring themes of the issues experienced in this transition by the interviewees. Those relevant topics were grouped and selected to form new themes. Figure 4.4 on the next page describes the creation and the evolution of the nine dimensions. Preliminary results from the first set of interviews determined the identification of the nodes.
Figure 4-4 Origins and evolution of themes
The readiness framework comprises nine dimensions: effectiveness; experience; service history; external engagement; culture and development; creativity; risk propensity; communication; and, awareness. The nine dimensions drawn from the data collected have been triangulated to the body of knowledge of the literature. The nine dimensions as a whole have been identified as key servitization factors of manufacturing firms. Although this is an exploratory study, the qualitative assessment of each dimension is visually represented in the radar diagram. The analysis and the testing of those nodes with the companies brought to the refinement of the readiness framework.

Table 4.5 below presents the nine dimensions to assess firms’ readiness in servitization, with key references and concepts that contributed to the creation of the readiness framework. Although servitization of small manufacturing companies is scarcely represented in the literature, studies of large organisations were found to be helpful in identifying broad issues that have been explored with the three manufacturing companies involved in this study.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Description</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Effectiveness</td>
<td>Past achievements as the foundations of the progress and growth of the company including the internal set of performance criteria.</td>
<td>Dynamic capabilities Eisenhardt and Martin, 2000; O’Reilly III and Tushman, 2004; Baldwin, 2003; Teece, 2007; Löfberg, 2014</td>
</tr>
<tr>
<td>#2 Experience</td>
<td>Configuration of capabilities and codification of new practice-based knowledge in the development team over time.</td>
<td>Parasuraman et al., 1985; Teece and Pisano, 1994; Thomson and Koskinen, 2012; Hafeez et al., 2002; Junginger, 2007</td>
</tr>
<tr>
<td>#3 Service History</td>
<td>Evolution of the offering from internal and external stimuli to anticipate or respond to customers’ needs.</td>
<td>de Brentani, 1991; Davies, 2004; Kindström and Kowalkowski, 2009; Avlonitis et al., 2013; Paiola et al., 2013; Baines et al., 2013; Kowalkowski et al., 2013; Dotzel et al., 2013; Löfberg, 2014</td>
</tr>
</tbody>
</table>
### Table 4-5 The nine dimensions: description and references

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>#4 External engagement</td>
<td>How companies relate in supply chain and non-supply chain relationships; the role that actors play in the network and the co-creation opportunities.</td>
<td>Davies, 2004; Prahalad and Ramaswamy, 2004; NESTA, 2007; Payne et al., 2008; Verganti, 2009; Grönroos, 2011; Chesbrough, 2012; Kowalkowski et al., 2013</td>
</tr>
<tr>
<td>#5 Culture and development</td>
<td>Existing staff capabilities and the learning mechanism to expand their competences further.</td>
<td>Baldwin, 2003; Davies et al., 2006; Gebauer et al., 2010; Martinez et al., 2010; Acklin, 2013; Paiola et al., 2013</td>
</tr>
<tr>
<td>#6 Creativity</td>
<td>Staff motivation; how to explore and test new ideas; the rewards system and the environment the development team is immersed in.</td>
<td>Eisenhardt and Martin, 2000; Teece, 2007</td>
</tr>
<tr>
<td>#7 Risk propensity</td>
<td>Attitude towards difficulties that the firm encounters to meet the requirements of the offering to enter the market.</td>
<td>Kahneman and Lovallo, 1993; Eisenhardt and Martin, 2000; Avlonitis et al., 2013</td>
</tr>
<tr>
<td>#8 Communication</td>
<td>Flow of information, how information is exchanged within the development team to assist the decision-making process.</td>
<td>Normann and Ramirez, 1993; Payne et al., 2008</td>
</tr>
<tr>
<td>#9 Awareness</td>
<td>Recognition of services as a critical component of value propositions for the customers to offer. Sensing opportunities</td>
<td>Chase, 1978; Parasuraman et al., 1985; Bitner, 1992; Normann and Ramirez, 1993; Morelli, 2003; Davies, 2004; Brown, 2009; Ates and Bititci, 2011; Bailey, 2012; Madden, 2013; Acklin, 2013; Avlonitis et al., 2013</td>
</tr>
</tbody>
</table>

The nine dimensions are the results of the analysis, coding of interviews with the manufacturing companies, and the deployment and testing of the readiness framework. Naming process of each dimension is the result of grouping, selecting and synthesising the core concepts that define manufacturing factors when achieving servitization.

### 4.9 HOW THE READINESS FRAMEWORK WORKS

The readiness framework consists of nine dimensions drawn from the literature review and findings of the first phase of interviews. Each of the nine dimensions includes three questions for the firms to answer.
according to three probes which are: state of adoption, frequency or intensity (see section 4.5 - Origins of the readiness framework). The firm answers the questions and senses how it scores on a list of three questions per dimensions, 27 questions in total (see appendix D), using a Likert scale from 0 to 5. Then, the results of the answers are reported in a radar diagram. Deploying the framework indicates a precise point in time regarding how firms spend their time and effort in achieving their goals. The readiness framework helps to build the set of recommendations for the firm willing to start the servitization journey and to implement further steps in considering servitization as an option to innovate a firm’s portfolio. The qualitative approach of the readiness framework with the nine dimensions equally represented in the radar diagram, promotes a more people-centric and attitude-driven firm in contrast to a competence and profit-driven organisation. In summary, the readiness framework allows manufacturing firms to reflect on their identity and acquired competences to face challenges ahead. Although the readiness framework is not a maturity model, recommendations based on the results and the identification of the steps to go from one stage to another are offered to undertake servitization.

4.10 PRINCIPLES OF THE READINESS FRAMEWORK

Service design research embraces design framing processes to tackle problems and offer solutions. The integrative approach of design, management, marketing, engineering and behavioural sciences taken in this thesis, stems from the origins of servitization as a multifaceted issue. While design has originally been recognised as contributing tangible and aesthetic elements, service design looks at the experiential elements and underpinnings of servitization as organisational change within manufacturing firms. The user-centred service innovation perspective (Walters et al., 2012) instils a human
perspective in the organisation and recognises individuals’ skillset and enables people to accomplish their goals. The readiness framework is an assessment tool for manufacturing companies to understand where their company fits in servitization. It combines the customer-centricity of the company of their development process and how this aspect impacts the way services are seen from a manufacturers’ point of view.

4.11 THE ORDER OF THE DIMENSIONS

Questions in the first set of interviews were asked from the general to the specific. In the same way, questions in the readiness framework were created to enable the interviewees to elicit their experiences and tell a story of their firms from past performances (effectiveness). In the dimensions that follow, experience provides information on the codification of knowledge and the configuration of the company for the next step to frame and take in the servitization journey. Table 4.6 below, provides a brief definition of the nine dimensions with a general question to introduce the respondent to the topics to be discussed in the three following questions.

<table>
<thead>
<tr>
<th>#1 EFFECTIVENESS</th>
<th>Differentiators</th>
<th>What has your company made to become what it is today?</th>
<th>This dimension considers the past achievements as the foundations of the progress and growth of your company including the internal set of performance criteria.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rate of success</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conversion rate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>#2 EXPERIENCE</th>
<th>Codification of knowledge</th>
<th>How would you define your offering in terms of breadth and depth?</th>
<th>This dimension considers the configuration of capabilities and the codification of new practice-based knowledge in the development team over the years.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>#3 SERVICE HISTORY</th>
<th>Characteristics of current offering</th>
<th>What is the nature of your offering?</th>
<th>This dimension considers the evolution of your offering from internal and external stimuli to anticipate or respond to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Opportunities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#4 EXTERNAL ENGAGEMENT</td>
<td>Degree of openness within and outside the supply chain</td>
<td>How do you relate to the external world?</td>
<td>This dimension considers the way companies relate in supply chain and non-supply chain relationships; the role that actors play in the network and the co-creation opportunities.</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------------------------------------</td>
<td>----------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Going upstream and downstream</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#5 CULTURE AND DEVELOPMENT</td>
<td>Nurturing culture</td>
<td>How does the learning process occur within the development team?</td>
<td>This dimension considers the existing staff capabilities and the learning mechanisms to expand them further.</td>
</tr>
<tr>
<td></td>
<td>Working and learning environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#6 CREATIVITY</td>
<td>Source of innovation</td>
<td>How do you encourage and motivate your employees to express their ideas?</td>
<td>This dimension considers staff motivation; the way they explore and test new ideas; the rewards system and the environment the development team is immersed in.</td>
</tr>
<tr>
<td></td>
<td>Rates of acceptance of ideas coming from employees</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Degree of openness of owner and managing director</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#7 RISK PROPENSITY</td>
<td>Attitude towards novelty</td>
<td>How do you manage novelty and uncertainty?</td>
<td>This dimension considers your attitude towards difficulties you encounter to meet the requirements of your offering to enter the market.</td>
</tr>
<tr>
<td></td>
<td>Level of acceptance and rejection</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Risk assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Risk perception</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resistance to change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#8 COMMUNICATION</td>
<td>Information flow</td>
<td>How do your employees access information within the development team?</td>
<td>This dimension considers the flow of information, the way it is exchanged within the development team to assist the decision-making process.</td>
</tr>
<tr>
<td></td>
<td>Level of formality and informality of information</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Existence of siloes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roles and responsibilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#9 AWARENESS</td>
<td>Ambitions related to customer-centricity and services</td>
<td>How do you consider solutions with both product and service components?</td>
<td>This dimension considers the recognition of services as a critical component of the value proposition for the</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The deployment of the readiness framework within the selected manufacturing firms is intended to test the relevance and validity of the topics that emerged from the first phase of research. Ultimately the output of the framework is the creation of readiness profiles that provide companies guidance on the next steps to take in the servitization journey.
5 TESTING THE READINESS FRAMEWORK

This is the second results chapter that documents the testing of the readiness framework. The deployment of the readiness framework at strategic and operational level in the selected manufacturing companies led to the creation of three design cases (Section 3.2.2 Design cases in the Methodology Chapter). As explained in Chapter 4, the radar diagrams show the perceptions of firms that completed the questions along the nine dimensions of the framework. An important part of the research is the iteration between results and analysis to refine the next stage of the investigation. At the end of each stage and before the next stage, each company provided feedback on the perception of the results of the framework.

5.1 INTERNAL PILOT

The readiness framework was created drawing from the literature review and building on the preliminary results of the first set of interviews. The readiness framework was internally tested with the Surgical and Prosthetic Design (SPD) Research Group within PDR (see table 5.1). SPD can arguably be thought of as analogous to a small firm because it offers doctors, clinicians and hospitals a mixture of products (prostheses) and services (consultancy in design and 3D printing prostheses). The internal pilot consisted of a semi-structured interview undertaken by the group leader. Data collected from the internal pilot was transcribed, analysed and coded. The purpose of this pilot was to refine and test the questions, the order of the dimensions and the relevance of content to firms.

Overview of the Surgical & Prosthetic Design (SPD) team at PDR

<table>
<thead>
<tr>
<th>Offering</th>
<th>Enterprise services with healthcare system (e.g. prosthetic design services). Research projects (e.g. implant design and surgical guide design).</th>
</tr>
</thead>
</table>
Testing the Readiness Framework

<table>
<thead>
<tr>
<th>Source of innovation</th>
<th>Customer-needs driven, collaboration with surgeons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development team</td>
<td>Head of Surgical &amp; Prosthetic Design Team; business development designer/engineer; technician; assistant researcher (no commercial)</td>
</tr>
<tr>
<td>Quotes</td>
<td>&quot;Our users are healthcare-system based rather than company based, so they have different motives to typical companies motivations where it's all about making money and that's all about delivering healthcare more effectively&quot;.</td>
</tr>
</tbody>
</table>

Table 5-1 Overview of the pilot

5.1.1 Results of the Internal Pilot Design Case

The interview with the head of SPD lasted 0:50:41 minutes. Table 5.2 presents the results of testing the readiness framework to the internal pilot.
# Internal Pilot (testing the readiness framework)

## Effectiveness

We are trying to spend what we do in research and enterprise back telling people this is high could you honestly understand users to do more effectively.

We measure the level of income purely on the price. Other measures of course are related to research output. I think we genuinely represent a very responsive service. We offer a very responsive service and that’s always a person at the end of the line and very personable service as well.

We’re not viewed in the same way that multinational corporation will be. Friendly and approachable. Once we get a customer we are generally pretty good at retain them. Although the market is changing quite rapidly as people now buy their own in-house manufacturing capabilities and start to develop in-house 3D design capability.

Yeah, if they can see that there is value in something that is relatively simple than come in further, upgraded. So let’s do more complex case studies.

## Experience

One of the biggest barriers in all industries and making personalized products is the length of time that the duration it takes to get something in there.

There is monitoring yeah. Yes, we do encourage monitoring, we got forms to feedback both on both on either the product performance if there is any necessary product modification for example, how the surgery went; any suggestion design; any suggestion on service improvement. In reality we don’t get a lot of them other than the surgeons that generally will sit down and ok the next case they thank for example by handle or the wrong side or something like that. So we revise our procedures in making what we can change in the next case.

## Service History

We usually have been approached by someone invited, we met at the conferences for this degree of information but it’s usually by word of mouth and peer-review of our service design.

Usually is customer-needs driven

Historically I’d say that was very poor actually in terms of service history, diversification and then sophistication, I think fair maybe.

I suppose we offer a small range of services but we offer them in great depth, so if that is what you mean in diversification is probably poor and depth and sophistication is probably good.

A combination of the product cost and do spend on this typically, illustrate the price of our design service and the price of the product everything is the result of the design service. Product-related services.

## External Engagement

We have a unique or a pretty unique close relationship with the people who use our services who are quite frequently the same people we collaborate on to undertake the research projects as well.

The things we would like to get involved is more external engagement.

Engagement with external parties in terms of knowledge transfer and for example sitting on boards of certain international foundation.

We haven’t been very good at assessing our competitors. And each of what we do is a bit of a challenge. And I
think we are probably cheap, too cheap. And that’s the feedback we had from talking with industry. Yeah, we work very close with companies in the same field. Some competitors or some suppliers are increasingly becoming competitors.

#5 CULTURE AND DEVELOPMENT
In the past I suppose we haven’t teamed up with many companies and increasingly that is going to be important part of our work. We have reviews for design model and design processes and regularly updated for this process based on the review. The reward is simply working here, I think. I think is really unusual I suppose.

#6 CREATIVITY
Yeah, I think we promote that whether or not it happens. Yeah by our nature we are exploratory I suppose. We encourage freedom through research and peer projects. (There are) no formal way of using resources that explores just independent ideas. But people are encouraged to write bids and get money into them and explore individual ideas.

#7 RISK PROPENSITY
There is a significance danger associated with us planning a lot of effort to coming up with a solution that they then circumstances changes in the clinical conditions therefore they don’t need this anymore. So it’s a big business risk. Surgeons rotate through different hospitals and... Because any regulation’s changed they are all changing very rapidly at the moment. And it’s a barrier have the internal knowledge to understand the implications towards services necessarily.

#8 COMMUNICATION
Occasionally, not enough internal communication. We’re not active in promotion to the degree which a company would certainly be. You get more feedback on failures. I don’t think we sit down and really review the customer journey often enough. I’m critically appraisal. Involvement customers again very good I think. I sit on the international board for people doing this kind of stuff, and promoting education in the area.

#9 AWARENESS
There is new regulatory framework we are striving towards. The plan is to become much more engaged with customers on a broader range of customers and broader range of specialities.

Table 5-2 Testing the readiness framework: results of the internal pilot
The head of SPD at PDR answered the first question (questions appendix D) of dimension #1 effectiveness, saying that they constantly try to show the relationship between what they do in research and how they apply it in practice. Their contribution is on understanding users to provide a more effective design service. They measure the level of income purely on price related to research output. They offer a very responsive service in a friendly and approachable way, and they are not seen as a large organisation. They have customers they retain, however the market is changing rapidly and people now buy their own in-house manufacturing capabilities and start to develop in-house 3D design capability. New customers usually start asking for a simple project and then they ask to do more complex case studies. In the dimension #2 (experience), the respondent said that one of the biggest barriers in all industries of making personalised products is the length of time it takes to make them. After sales, they encourage monitoring, through forms requesting feedback on the product performance, if there is any necessary product modification and how the surgery went, and any suggestions and improvements. They are not overwhelmed with responses, and it is usually only the surgeons that complete them. After that, they revise their procedures. In terms of service history (dimension #3), they have usually been approached following attendance at conferences, and it is usually by word of mouth and peer-review of their customer-needs driven design services that they obtain new projects. The breath (diversification) of their offering was scored poor, however it was considered fairly sophisticated because it offers a small range of services in great depth. They offer product-related services as a combination of design and printing services and selling the product itself. Having a unique relationship with people they collaborate with and they undertake research projects with, relates to the questions on external engagement (dimension #4). In addition, they would like to get involved with external parties for knowledge transfer and sitting on boards of international foundations.
They say they have not been very good at assessing their competitors, and each aspect of what they do is a bit of a challenge. They think they are probably under-priced as they discovered talking with industry. In terms of relationships with other companies, they work very closely with companies in the same field. However, some competitors or some suppliers are increasingly becoming competitors. In the past, they stated that they have not teamed up with many companies and that increasingly this will be important part of their work (dimension #5 culture and development). Through reviews the regularly update their design models and design processes (process-based review). The reward is simply working there, because they think it is unusual to work in that environment. They internally promote creativity (dimension #6). By nature, the group is exploratory and group members are encouraged to pursue their relevant research topics. Risk propensity (dimension #7) takes the form of business risk when there is a significant danger associated with them expending a lot of effort in coming up with a solution when circumstances change in the clinical conditions and the client does not need that solution anymore. Another aspect is that surgeons rotate through different hospitals. Regulations also change very rapidly. For dimensions #8 (communication), they do not see themselves as actively promoting they offering to the same degree that a private company would. They usually get more feedback on failures. They do not think they focus and review the customer journey often enough. However, customer involvement is scored very well. The head of the unit sits on an international board for promoting education in the area. In the future (answering the questions of dimension #9 - awareness), they have to work towards a new regulatory framework. They also plan to become much more engaged on a broader range of customers and broader range of specialities.

Testing the readiness framework in the field with an internal pilot has been helpful to see of the questions in terms of structure and flow to
make it relevant to the respondent. Minor changes in wording were made to improve the understanding of the questions. The framework worked well to raise awareness regarding the servitization process.

5.2 PRESENTING THE RESULTS

Following the pilot with SPD, the readiness framework was deployed with Companies A, B and C (selection criteria are described in the methodology Chapter 3, Section 3.2.3 - Design Cases’ selection strategies and Section 3.4 - Research execution). Three manufacturing companies contributed to this thesis, referred to as companies A, B and C. Table 5.3 below presents Companies A, B and C along the number of employees and annual turnover. Although the design cases in this thesis cannot claim to uncover generalisable results, it is perhaps notable that similarities were found between the two smaller Companies (B and C) that differentiated these cases from the larger case (A).

<table>
<thead>
<tr>
<th>Company</th>
<th>Employees</th>
<th>Annual turnover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A - Ventilation systems</td>
<td>460</td>
<td>67m £</td>
</tr>
<tr>
<td>Company B - Electrochemical water treatment</td>
<td>10</td>
<td>1.5m £</td>
</tr>
<tr>
<td>Company C - Special purpose machines and automation</td>
<td>34</td>
<td>1-10m £</td>
</tr>
</tbody>
</table>

Table 5-3 Introducing Companies A, B and C

Table 5.4 below summarises the participating firms; the time spent with each of them; and, the time in total to collect data with the three companies, listing people involved and their roles.

<table>
<thead>
<tr>
<th>Company</th>
<th>Role</th>
<th>Topic discussed</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A</td>
<td>Marketing Director</td>
<td>Introduction Semi-structured interview Follow-up Semi-structured interview</td>
<td>4:47:00</td>
</tr>
<tr>
<td></td>
<td>Operations Director</td>
<td>Readiness framework</td>
<td></td>
</tr>
<tr>
<td>Company B</td>
<td>Managing Director and Operations Director</td>
<td>Introduction Semi-structured interview Readiness framework</td>
<td>3:51:04</td>
</tr>
<tr>
<td></td>
<td>Technical Manager Engineer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The three design cases are based on the data collected from the deployment of the readiness framework. All the interviews lasted between an hour and an hour and a half. The board level answers are represented in radar diagrams that show readiness from one to five in each dimension. Interviews took place in the participating firm’s workplace. Audio was recorded and transcribed. Analysis of the content was coded, so that excerpts of the interviews have been linked to the nine dimensions (see the diagram on the origins and the evolution of the readiness framework on chapter 4 – section 4.8).

While answering the semi-structured interviews, respondents were expected to reply to the Likert scale providing information on the three probes (state of adoption, intensity and frequency); they were encouraged to add details to motivate their answers so that some responses were used under multiple dimensions. The following sections present the three design cases developed in this research study. Each of them is described with an overview of the company; results are then presented for the three phases: exploring; deepening understanding; and analysis and outcomes with a set of recommendations for the company. The chapter ends with an overview of the key results for each phase.

5.3 DESIGN CASE COMPANY A

Company A is a manufacturing company with over 460 employees that has been operating in the ventilation systems market for over 50 years. Between 2010-2013 it was involved in the Service Design Programme (a Welsh Government programme to help companies
explore the development of services through service design). As a result of the project, Company A realised that training third party installers plays a key role in the correct installation of their products, reduces frustrations of installers and, ultimately, better serves customers. They have a strong brand and sell a wide range of ventilation products from single fans for residential purposes to complex ventilation systems for commercial purposes. Currently no revenues come from selling services. Hidden services such as drawing and consulting are intended to support product sales. Although service design tools are used in their development process activities, the marketing director showed uncertainty on the real need to see their products as services because of the lack of immediate evident economic rewards. Service design is used within the marketing department at the very front-end of the development process to support NPD, but no NSD is in place. Service design tools such as customer journey mapping and personas are used to assist the development decision making process. The operations director’s perspective showed the key role of the operations department as an interface between the engineering department and the manufacturing workshop facility. The service components are informed by the pre- and post- sales support and assistance provided. It is measured through sales representatives’ performance and customers’ happiness. Services are under ongoing refinement process.

5.3.1 RESULTS PHASE 2 – DEEPENING UNDERSTANDING

This section presents data collected when deploying the readiness framework with the Marketing Director and Operations Director of Company A. Excerpts of the interviews have been linked to the nine dimensions. Some quotes are used under multiple dimensions. A subset of themes has been identified to investigate each dimension further.
In the first dimension (effectiveness), the Marketing Director of Company A states that they are a product-based innovation company and that they always start with designing a product. They are a product-company, willing to design products, expensive, seen as the Rolls Royce in the ventilation industry. They have been using service design tools to help the business to be more focused, for business initiatives, and across different areas. They are not willing to become a service company: it is not profitable. In terms of performance, at the moment it is measured in sales of products as a combination of relationship with customers, trust, brand, reputation, support offered, and awareness. A product is a successful product when it meets customers’ needs on time.

Dimension #2 Experience investigates the formalisation of the design process and how offering is created. Company A follows a formalised NPD process, but declare that the design process for service design is loose. When gaining experience, failures are the biggest source of lessons learnt. A feedback loop at the end of the projects is a way to track mistakes. Knowledge is built upon successes too. In business, personal motivation is a key driver, to find what is exciting and challenging in your job to meet with the company ambition and opportunities. Clients and users are involved in the design process through visits to the factory.

In the service history dimension (dimension #3), revenues originate from products and services push the sales of products. In terms of breadth and depth, their offering spans from a small bathroom fan to airport air conditioning and everything in between. For Company A the service element is included in the price of the kit (such as drawings, design, quotes, all the supporting documentation, level of support, touchpoints and interaction and the quality of the product). The Marketing Director claims that service is a *strange thing really* because of the type of service that they offer. Their services are “*sort of hidden in all sorts of things and are given for free*”, the Marketing
Director said. For instance advice, support and consultancy are given for free. They are not charging for training, installation, after-care, drawing before sales, or product selection in the pre-sales. The Marketing Director considers the service potential as the effort to offer a better level of service when they sell their product. Successful projects come from special, bespoken units, at the forefront need. They help clients to solve their problem, and then make a product group. Sales people and representatives play a key role in collecting insights from users that are then translated by the marketing and design team.

External engagement (dimension #4) is influenced by the internal capability to develop new solutions. Collaboration with competitors and suppliers is risky for intellectual property (IP) protection; on occasion they come up with bespoke solutions. They specify what the supplier can do (setting the boundaries) and involvement in a limited part of the process. They have non-business related involvement with companies in the same field (ventilation industry) to work on the next level of legislation (not to develop new solutions or value propositions). They occasionally test competitors’ products to prove their products do what they say. Again, the role of sales and reps is important because they are so tightly connected to the customer that they are able to determine customer frustration.

Culture and development (dimension #5) stems from the product-based company that mainly includes product designers and sales people. The requisite of employees is to get their job done. There are regular reviews with directors from the different departments, and the operations director plays an active role and presence throughout the office. The attitude is that there is always room for improvement is supported in the operations office environment. The Operations Director states that they are not afraid to make mistakes. They can make any mistakes but make them just once. They do not deal with the end user but they serve someone who is serving the customer.
The Marketing Director says that they have family business type of mentality. They have an internal product proposal form for employees to evaluate the level of feasibility of the ideas presented, to hear document customer feedback during preliminary testing, and financial data to suggest new products. They have an informal suggestion system too, because product designers are expected to come up with good ideas. The Operations Director created a skills matrix along with smart objectives tailored to keep motivation and relevance high because the target must be something achievable and measurable for his staff. In terms of promotions, they tend to hire internally first, to provide opportunities for different roles. The incentives system differs within the company; for instance, reps’ incentives are based on sales orders and the rest of the company is based on invoice. They also encourage key people within the company to attend conferences and exhibitions.

Creativity (dimensions #6) explores the working environment. Company A says that there are good working conditions (e.g. there are rooms to meet and to encourage collaboration among different functions). However, engineers tend not to be very good at speaking to people, so that iteration of questions and information are needed. They work on the affordability of ideas in terms of money and resources, prioritisation moves to ideas generated to the next stage, where they can be evaluated quickly. They do have a prototype lab and testing facilities on site. The Operations Directors says that his department is the conduit between the customers outside (through the sales and reps) and the engineers and workshop inside. They are “sort of coordinating between inside and outside of the company” (as the Operations Director stated).

Questions on risk propensity (dimension #7) were based on the fact that they consider themselves as a product-based innovation company. They say that their engineers tend not to be very good at speaking to people because they don’t see customers, they probably
should, but they don’t (Marketing and Operations Directors). Their
driver is what is lucrative, with the shortest payback. They have a
strong focus on financials. They consider that they are not financially
risky. They say that they never put money into an initiative that they
think they could pose a financial risk before gaining a reward. They
are still questioning if they really need a service. They do not see
enough return in a service model yet. They are trying to answer
questions on the amount of resources needed or costs associated
with developing product or service. The Marketing Director says: *If I
get money from services, can I make money from products?*

When framing servitization, the Marketing Director thinks that on one
side, the customer-facing part of the business (the sales and
marketing divisions) is used to change. On the other side, the
manufacturing and operation side of the business (engineering,
manufacturing, purchases) is less used to change. A detailed product
assessment comprises: usability, product features, and services. They
then go to the next stage which determines quantitative, volumes,
pricing, costing: “*When developing something new, it is not easy to
assess how good it is, how much are you gonna spend; and, how
much is gonna back from it*” (except from the Marketing Director’s
interviews). Based on that preliminary information, they rank the
project. When talking about risk propensity, the Marketing Director
focus more on risk mitigation, the risk of cannibalisation, and the new
legislation to apply to products.

In Company A, communication (dimension #8) takes the form of
informal communication between departments: “*We are sort of
teasing each other, that sort of friendly rivalry. We find that (informal
communication and friendly rivalry) keeps HUGE communication
between departments. Because we have these project teams, because it’s all matrixed, the communication happens anyways*”
(statements of the Operations Director). In terms of flow of
information, there is always some confidential information at senior
level. However, whenever they have regular meetings there is regular communication down to the team. They say to have a strong structure you need to understand prioritisation. If that project team understand the value of that project, it gains priorities within their businesses. Company A is structured in departments and communication usually flows within and amongst the departments. And in terms of information, key individuals are change agents within the company.

In terms of awareness (dimension #9), they say that design tends to be anything to do with our customer. Again that service design is not just designing a new service. And manufacturing is not just making one thing in one place. They use service design tools at two levels. They look at service design in terms of formally creating services that can be delivered and service design as a tool helping make decisions elsewhere. All of the tools that have been developed for service design are customer-centric. In the near future they have a particular driver that is to try to improve their customer service; in 6-12 months they are planning to monitor and survey customer service, and to change their internal behaviour to align with the CSAT customer service scoring. They want to understand why customers are marking them down and fix the mistakes together. The Operations Directors is working on a way to measure the customer questions to help performance, individually.
5.3.2 RESULTS PHASE 3 – ANALYSIS AND OUTCOMES

In the analysis and outcomes phase, answers of the Marketing Director of Company A on the deployment of the readiness framework were reported into the radar diagram below (figure 5.1).

![Radar diagram of Company A](image)

The radar diagram above is referred to the Marketing Director’s point of view only and a summary of the results is presented below (table 5.5).

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Effectiveness</td>
<td>4</td>
</tr>
<tr>
<td>#2 Experience</td>
<td>4</td>
</tr>
<tr>
<td>#3 Service history</td>
<td>3</td>
</tr>
<tr>
<td>#4 External engagement</td>
<td>3</td>
</tr>
<tr>
<td>#5 Culture and development</td>
<td>4</td>
</tr>
<tr>
<td>#6 Creativity</td>
<td>4</td>
</tr>
<tr>
<td>#7 Risk propensity</td>
<td>3</td>
</tr>
<tr>
<td>#8 Communication</td>
<td>4</td>
</tr>
<tr>
<td>#9 Awareness</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 5-5 Results of Company A

Based on Company A’s perception, table 5.5 above presents the results of the interview with the Marketing Director of Company A. In
the Likert scale from 1 to 5, the answers given show that this company is positioned highly in the readiness framework that takes into account the conditions considered important for servitization. In the radar diagram, service history, external engagement and risk propensity are scored lower than the other dimensions.

5.3.3 FEEDBACK MARKETING DIRECTOR

As part of the research, the feedback of the Marketing Director on the readiness framework and how to approach servitization is presented below:

- To focus on part of the process with a precise idea of intervention or contribution. For instance mapping out where the company is and where it could be, and showing the process to get there in order to help companies.
- Benchmark other companies with different sizes and different diagrams, as it is useful to see what’s good and bad about different companies
- The description of previous cases with step-by-step description of the change implementation (e.g. experience and best practices in smaller firms; similarities and differences between businesses)
- To provide guidance to move up the framework to better implement services based on the results.
- Measure and quantify steps to move up the radar diagram to implement services
Below is presented the Operations Director’s feedback on the readiness framework and his perspective on how to approach servitization:

- The conceptualisation of product and service together.
- To show an average on the same graph with a dotted line to let the company compare how it is performing compared to others (better/worse/same).
- The contextualisation of product and service as functions within the firm.
- To map out the origins of revenues.
- To know about the cost of customer when providing services
Company B is a family-owned business that operates in electro-chemical water treatment with more than 10 employees. The CEO/Technical Director founded the company. It is an R&D focussed business, prototyping and testing the plants they design to address clients’ requirements.

Between 2010-2013 Company B was involved in the Welsh Government Service Design Programme. The engagement helped them to make the service element more explicit in their offering and create a better experience for their clients. With the advancement of technology, they introduced a remote control that enabled them to shift from selling plants to leasing them. They are currently involved in a large project promoted by a local river authority that involved a network of stakeholders in the farming community to dry waste and treat water. They are working on how to extend the use of the plant once water is cleaned. Employees appear well motivated around the regular development and testing of new products for clients. Below the results from the application of the readiness framework are presented. Compared to Company A and C, Company B performed higher scores due to the fact that they have started implementing services in their offering.
RESULTS PHASE 2 – DEEPENING UNDERSTANDING

This section presents data collected when deploying the readiness framework with the CEO/Technical Director of Company B. Excerpts of the interview are representative of the questions asked along the nine dimensions. A subset of themes has been identified to investigate each dimension further. In the first dimension (effectiveness), the CEO of Company B stated that his company is a technology manufacturing company. The quality of product equals the quality of team that equals the quality of technology that again equals the quality of investment and the image of the firm. Their success is based on evidence and they obtain new projects and credibility through word-of-mouth, and the working prototypes and trials they offer to clients before sales. Effectiveness takes place through management: looking at the business in terms of where the margin comes in and out; making sure of the quantitative and criteria, qualitative, operations, and inputs. Success is measured through product sales and profitability. Company B adds value to their products protecting their ideas with patents and accreditations to enter a market.

Experience (dimension #2) is gained focusing on prototypes through a learning-by-doing approach demonstrating that the prototype works. After that, the service conversion of prototype to a marketable product occurs. The CEO/Technical Director stated that “when you’re making something you can feel the vibration through the machine and you get an idea of fabricating at a slow pace so you might stop and think”. Over the years knowledge is acquired on the market potential, technology, environment, and legal and political aspects. At the moment the market is evolving to be environmentally friendly and Company B is just looking at water recovery and recycling. From context analysis to solution development, they incorporate the market needs and features into the product. In the early days they produced different design every time. Experience is built on
successes; however, some of the hardest lessons come from failures. Failure is seen as an opportunity by Company B. They stated that two different skillsets are needed: product development and marketing sales. As the company grows, they have to identify people good at deepening skills based on the CEO competences (background in science engineering and the Operations Director in mechanical engineering and specialty in management) and that they can take the lead. The CEO is “the jelly that holds all of them together”.

In Company B, service history (dimension #3) is described for the shift of selling plants to water cleaned/treated per hour (current origin of the revenues). The service element includes the design and manufacture of mechanical parts and the remote control of the plants. Ideas usually come from the CEO or Technical Director. Sometimes the client helps quite a lot, and they can be quite demanding. The evolution from product to product service system started when they found that the site was a critical problem, so they started developing a remote control interface for water plants. Service is usually developed along with the product development of existing products, supporting manufacturing and supporting all functions. At the beginning they provided the full treatment process. The business model has changed from traditionally doing one-off plants. They started electrochemical water treatment and they can now generate electricity from waste water. They identified the commercial benefits of service (e.g. containerise plants to ship and then plug and play units) during the Service Design programme. Opening up to other markets, they shifted from selling units to account leasing, working on tankage and now working on process waste. They worked on the remote control because it was difficult to be on site. They said that service is an extension of what they have done. The CEO started with the idea of using ultrasounds to clean water. Now, they are working on self-contained treatment plants; a utility treatment plant to be shared between two farms thanks grants
that have allowed them to buy equipment, “so that it (service) closes the circle”.

External engagement (dimension #4) describes Company B’s involvement with competitors. They occasionally pass across a contract to competitors and vice versa. Amongst their competitors, there is only one of their competitors that they would not deal with. But, generally within the market they help each other out. The market is quite differentiated and there is a niche where we all fit together (selected competitors and suppliers). They constantly deal with suppliers; end manufacturers have skills outside our knowledge that complement the tool they’ve got; joint-ventures with a control systems company who designs the core, and their kit integrates into systems that then will be sold in the utilities. They seldom collaborate with companies in other fields as an opportunity for networking. The utility companies they work for (their customers) are incredibly conservative. Company B perceives that it is probably viewed as a threat from a lot of companies outside. They also collaborate with universities and colleges. In the farming community, all the stakeholders work together to develop equipment that will be able to separate the waste or dry it. Customers are involved throughout the process. During the sales meeting the clients tell Company B what they want. Usually the product process is about 85-90% what customers want but then they have “to do the tailoring to make it suit”. Customers’ feedback is very important and those clients speak to other possible clients. To engage with their potential customers they usually offer a walk-through of the full design of the plant to see how something is constructed beforehand.

Culture and development (dimension #5) highlights the centrality of the CEO within the company. He is considered by his employees as “incredibly inventive”. Workshop people said that “he is very much of ‘the bigger the challenge, the more the opportunity’ that is the mindset”. The CEO says that the best product would be where people
contributed as it goes round a number of iterations; when the problem comes out; nobody can state I did that, clearly is not their ownership or this is the best way of doing it. Then, final decisions are made all together. Everybody comes up with different suggestions all the time. They have a monthly technology meeting so new ideas are promoted and new ideas are progressed through that form of meeting channel. They were suggested to make some changes in the manufacturing area. They emptied the workshop and re-structured it: same people, same amount of staff, same roles. It was just the efficiency. When and where needed, further staff training is identified for professional development and visits to trade exhibitions and centres of excellence are arranged. Professional development is not much about training, but it is awareness of how the world is growing and what they can use to adapt to their processes. Employees showed a sense of belonging and pride: “it’s incredible to be fair to be working here [...] It’s a very positive mindset working in. It’s very unusual to be able to develop things in parallel. So, it’s surprising to be fair and yeah, everybody has input here. And it is taken on board as well”. They say they are constantly innovating and adapting; they use R&D all the time. The CEO states: “we are sort of pushing all those boundaries with everything that we’re doing”. A technician of Company B says that “a little bit of openness in your organisation would make a difference”.

Creativity (dimension #6) is promoted by the working environment. Health and safety regulations are followed. Before the Service Design programme there was no heating in the factory, now the workplace is warm. “It is tidy; it is not over the top, but it is functional”. Although their core business is manufacturing, all your time is spent on R&D as well. Each one of them are involved in different areas of the business, everybody interacts with each other. When somebody comes up with an idea, they work on a prototype and see if it works. They recently got access to the university library to consult papers and standards.
Risk propensity (dimension #7) is usually concerned to the approach of embracing novelty. In Company B, novelty is highly encouraged. The CEO or Technical Director is working in the R&D and workshop on a regular basis and he encourages his employees to do the same. “There is always input coming in and nobody is frightened to proof that input as well”. When beginning a new project, they do the prototype; if the prototype is consistently working, then they look at the legislation that would drive it. Finally, they will be trying to work around production, management, legislation to get the proof product” (statements of the CEO).

Communication (dimension #8) - Information is all shared in the same place so that it is easy to access by everybody in the company. They state that information exchange is quite easy in a small company because they are always interfacing to each other. From the initial process to the end of it everybody is involved in it at some point along the line.

Awareness (dimension #9) looks at choices to make in the short, medium and long term. In the past, there were lots of water treatment plants that Company B just sold and never heard from those clients again. However, they want to set themselves as a technology manufacturing company. They are trying to make the technology so sophisticated that the software is more user-friendly. They essentially want to make the product that is purchased by their clients easier to manage, handle, and possibly taking over on some of the operational tasks. Next challenge is to enter the utility market - water utility, drinking water. They are also working on future applications of their technology (e.g. combination of electrolysis and power ultrasound applicable to a number of fields). They can use renewable power generation to power the water treatment. As the company grows, the CEO has to create a set of criteria to manage this evolution.
In the analysis and outcomes phase, answers of the CEO Company B on the deployment of the readiness framework were reported into the radar diagram below (figure 5.2).

![Radar diagram of Company B](image)

The radar diagram above refers to the MD’s perspective only and a summary of the results is presented below (table 5.6).

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Effectiveness</td>
<td>5</td>
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<td>#3 Service history</td>
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<tr>
<td>#5 Culture and development</td>
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</tr>
<tr>
<td>#6 Creativity</td>
<td>4</td>
</tr>
<tr>
<td>#7 Risk propensity</td>
<td>4</td>
</tr>
<tr>
<td>#8 Communication</td>
<td>5</td>
</tr>
<tr>
<td>#9 Awareness</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 5-6 Results Company B
Based on Company B’s perception, the answers given show that this company is mostly positioned in an advanced state of servitization in the readiness framework with dimensions scoring from 3 in the external engagement to 5 in effectiveness and communication.

### 5.4.3 FEEDBACK CEO

As part of the research, feedback of the CEO on the readiness framework and how to approach servitization is presented below:

- The readiness framework is a reflective upon past and future.
- To add profitability as a new dimension to complete the framework.
- To work on the prioritization of the dimensions.
- Iteration of the readiness to notice alignment between past meeting, expectations.

### 5.4.4 FEEDBACK WORKSHOP EMPLOYEES

Comments that the workshop staff made on the readiness framework and how to approach servitization, are presented below:

- To clarify the definition of service.
- Services can be seen as internal functions.
- Motivation and personal development: perception of the vision of the future over the years.
5.5 DESIGN CASE COMPANY C

Company C is an established company with 34 employees that has been producing special purpose machine and automation systems for over 20 years. There are no standard catalogues of products since ‘every project is a launch’, as reported by the managing director during one of the interviews. The dynamic environment pushes them to undertake ongoing research, and requires high levels of flexibility and technology.

This company was selected because it is new to the idea of customer-centricity with no previous knowledge on service design. However, they are driven to start offering services following a client’s request to formalise a maintenance contract. Focussing on the happiness of the customers and employees are already perceived as key drivers for the performance of the company.

A key finding from the interviews (as perceived by the MD) is the lack of informal communication and the inability of engineers to empathise with customers and operators due to their functional requirement viewpoints. This has a huge impact on the hiring process of new staff to manage the company’s planned growth. During the interviews the MD became aware of the organisational and system level requirement from servitization and perceived his firm having the capabilities but lacking the infrastructure to implement services.

In the following pages are the results of the application of the readiness framework. Compared to Company A and B, company C performed lower scores for the fact that it was at the very beginning of starting to consider services. In the past the firm was successful and gained experience selling the one-off machines that it produces. Now, with the willingness of undertaking servitization, the poor level of internal communication and flow of information were found to hinder the service implementation further.
5.5.1 RESULTS PHASE 2 – DEEPENING UNDERSTANDING

This section presents data collected when deploying the readiness framework with the Managing Director of Company C. Excerpts of the interview are representative of the questions asked along the nine dimensions. A subset of themes has been identified to investigate each dimension further.

The Managing Director responded to the questions on the effectiveness (dimension #1) saying that: "Every project is a launch" and products are the results of quality, cost and delivery. They focus on the quality of the product from quote, design, manufacture. Their responsiveness is variable for many reasons such as Company C’s fault, the complexity of the enquiry or not enough information from the client. They measure performance not only from a financial perspective (profitability) but also softer drivers (perception of happiness within the company and perception of customer satisfaction). There is a formality and informal customer feedback they obtain.

Over the years they gained a lot of experience “by doing it wrong” (dimension #2: experience), developing and refining a 14-steps development process, formalising a lot of tacit knowledge. At the outset of his career, the Managing Director started his role as an apprentice working in different departments. Now, he is the Managing Director of Company C. He says that he usually “takes a helicopter overview and goes down into the bushes” when needed. Company C’s skillset comprises: electrical, mechanical and software engineers and the workshop staff. There is group leadership to develop projects. At different phases, any member of the team can interface with the customer to understand their needs and sense opportunities. Customers are involved in: visits to the factory, internal reviews, and design reviews to keep everybody on the same page and to share the
responsibility. However, he states that people in the workshop do not interact much with the customers (e.g. operators’ involvement).

Experience is gained through lessons-learnt which are all project-driven. They say to always learn from the success and from failure. He raises awareness on the role of tacit knowledge. The internal driver of the Managing Director is to create a good company. There are no external drivers because he considered himself more challenging than the external environment.

The personal motivation of the workshop supervisor is supervising the team and the machines as well. He started as a machinist and has become the workshop supervisor. He states he was given the opportunity and the experience to do it. The Managing Director says that the firm needs more people who very knowledgeable and as a result people are low in attitude and passion. He highlights that the working environment is dynamic and people have to adapt accordingly.

In dimension #3 (service history), the Managing Director states that revenues originate from selling products. Currently, no revenues come from service or very little (time-based maintenance and training to operators are included in the transaction). Ideas are developed from the brief of the client then refined. It comes from outside, the job is explained to the design team and designs a frequently looped (iterated). The Managing Director mentioned that a former client asked him to offer service contracts to maintain his machines. Initial discussion is on providing an annual package which covers a defined amount, but that there may be further scope. The MD and the purchases project manager are considering how to deal with it because there are not many people in the market providing such a maintenance program; firms that buy their machines have their own maintenance departments. They have been often responding to clients’ request to give on-site support for free. But
they are now willing to start charging them. Each product is different, so customers return for new ones and for different projects. At the moment Company C offers only time-based maintenance and warranty.

The Managing Director describes external engagement (dimension #4) as a bow-tie shaped relationship between his clients and his company. They occasionally work with other companies in different fields. They do work for each other on an irregular basis (e.g. for capacity reasons). They highlight the fact that they never work with competitors. They have actually worked with other companies who are in parallel sector but not competitors. The Managing Directors of Company C is involved in a number of activities in boards and programmes that focus on the overall business environment rather than single projects. The role of suppliers is to help Company C to some extent; however they tend to keep the ideas inside.

In culture and development (dimension #5), Company C emphasizes the focus on individuals: critical thinking, personal transformation, self-awareness, knowledge. The Managing Director looks for the meta-abilities of his employees that are about all the tasks, because “at the end of the day companies are people”. In terms of professional development and people attitude, The Manging Director states the importance of the apprenticeship and time for the person to develop skills. He created a set of criteria for departmental assessment and individual assessment (80% behavioural characteristics and so 20% task, people are more task-orientated). He is also encouraging the ‘future leader programme’ which is more a longer term development for his employees. The Managing Director works on giving a sense of direction to the firm and to continuous improvement. The workshop supervisor considers the company he works for as a little family which is the culture that the MD created and he wants to keep it that way, the more they grow the more difficult it is to maintain because everybody is different. In the past
there was an incentive system in place but that was then removed because it could be demotivating if not taken seriously enough by everybody. Apprentices are encouraged to undergo training and visit trade exhibitions to have a look around and to learn about new technology.

Dimension #6 explores the role of creativity within the company. The Managing Director says that the creative space that he created is not used as it was planned. Employees are expected to explore new ideas all of the time on all the projects. The Managing Director doubts how creative individuals are, outside of task that they perform. He says his employees are very task-orientated. Throughout all the phases, everybody can be involved. They usually start off in a small group and work outwards to a larger group, then go back to a smaller group. The Managing Director set up a forum on a regular basis in which groups of five employees can put forward ideas or suggestions.

Risk propensity (dimension #7) is described as the dynamic environment with complex tasks that they deal with daily. Technology is not a barrier to Company C. When starting a new project, they would like to start with the end in mind. They are not familiar with not knowing what the next step is. The Managing Directors considers himself as more risk averse or risk aware than others. But he states that “the resistance to change will be of the individuals, not who is comfortable in their place and uncomfortable of going into another. The culture has slightly changed because they had to adapt to new surroundings as well, we had a new extension at the back”. They say they had to adapt to a lot of change and it was quite difficult at first to get people to buy into it. This applies to the customer-centric idea and the fact they make machines.

Based on the answers of the Managing Director on communication (dimension #8), internal communication is considered not good enough; people focused on their tasks, they do not tend to share or
say something to somebody else (as far as the MD thinks). Project-related communication (driven communication) is going on amongst the groups but the Managing Director says that free communication is not high enough. In the ninth dimension (awareness), Company C is working on building service contracts to the former client. The Managing Director considers his company to have the ability and the capability but not the infrastructure to do it. For Company C to grow, they have to employ new people, however, they say that they are not finding the right individuals to be able to move forward.

5.5.2 RESULTS PHASE 3 – ANALYSIS AND OUTCOMES

In the analysis and outcomes phase, answers of the Managing Director of Company C on the deployment of the readiness framework were reported into the radar diagram below (figure 5.3).

![Figure 5-3 Radar diagram of Company C](image)

The radar diagram above is referred to the Managing Director’s point of view only as table 5.7 reports.
<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Effectiveness</td>
<td>3</td>
</tr>
<tr>
<td>#2 Experience</td>
<td>4</td>
</tr>
<tr>
<td>#3 Service history</td>
<td>3</td>
</tr>
<tr>
<td>#4 External engagement</td>
<td>3</td>
</tr>
<tr>
<td>#5 Culture and development</td>
<td>3</td>
</tr>
<tr>
<td>#6 Creativity</td>
<td>2</td>
</tr>
<tr>
<td>#7 Risk propensity</td>
<td>2</td>
</tr>
<tr>
<td>#8 Communication</td>
<td>3</td>
</tr>
<tr>
<td>#9 Awareness</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 5-7 Results Company C

Based on Company C’s perception (table 5.7), the answers given show that this company has recently become interested in exploring services. The diagram shows that the experience and awareness dimensions scored relatively highly in the readiness framework. The answers in creativity and risk propensity resulted in lower scores in the radar diagram.

5.5.3 FEEDBACK MANAGING DIRECTOR

As part of the research, the feedback provided by the CEO on the readiness framework and how to approach servitization is presented below:

- To understand and frame the potential of the service within the company as a whole to overcome the internal resistance to change.
- Awareness and experience are very important because they are the foundations.
- To communicate and help employees to understand choices to build the future. ("And it’s, it’s easier looking back than looking forwards").
5.6 SUMMARY OF THE RESULTS

A summary of the results of phase 2 – Deepening Understanding and Phase 3 - Analysis and outcomes that led to the creation of three design cases, are presented in the following sections.

5.6.1 PHASE 2 - DEEPENING UNDERSTANDING

The explorative phase led to the creation of three groups with the following themes that emerged:

- Build on past successes, learn from failures
- Company growth and hiring people (the right people to take the step forward)
- Strong focus on or presence of the leader in Company B and C (not about the business and profitability)
- Key role of the entrepreneur (background, skills and attitude)
- Engagement and involvement of employees (motivation, a sense of direction, invest in people)
- Customer-oriented approach to provide better solutions (create and maintain relationships with customers)
- Identity and culture affect the sense of belonging to the firm
- Flexibility and variety of the tasks to advance professional careers
- Internal ideation process (IP reasons), importance of communication and flow of information
- Focus on growth (and how to build the steps for implementation)
- Understanding the benefits of servitization (also economic ones)
- External engagement at the outset of a new project to frame or define the issues.
Based on the results of the deployment of the readiness framework with the three firms, the table below summarises analysis and outcomes of the interviews.

Results of phase 3 – Analysis and outcomes are presented in table 5.8 below.

<table>
<thead>
<tr>
<th>Company A</th>
<th>Company B</th>
<th>Company C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial aspect</td>
<td>Financial aspect profitability (as an extra dimension)</td>
<td>Financial aspect profitability (and link to knowledge and training)</td>
</tr>
<tr>
<td>Understand the whole return on investment (from identification of improvement areas, to implementation, costs of implementation and payback of it).</td>
<td>so to a certain extent you could see a company structure on to that diagram (1 dimension = a person, then a department when the firm grows, hierarchy)</td>
<td>Community type knowledge technical (apprenticeship) and behavioral aspects community elders to give advice</td>
</tr>
<tr>
<td>Link to affordability of servitization cost of customer</td>
<td>Products: patents Service: brand</td>
<td>Set of experience Looking at that and knowing us, you know, I think that’s quite representative [ok] and probably those two (awareness and experience) across the company would be lower but as a directional thing it’s quite, it’s quite reasonable. Some individuals are very technically confident but situationally unaware</td>
</tr>
<tr>
<td>I think you probably other fields are good but in the same sector</td>
<td>So, in terms of technology companies creativity will be patents. In terms of product-service what’s the novelty of the service? How do you protect it? What’s your brand? Brand and patents would be the same like coffee.</td>
<td>Resistance to change I think a lot of people don’t see the need, the need to change.</td>
</tr>
<tr>
<td>Benchmark other companies with different sizes and different diagrams, useful to see what’s good and bad about different companies</td>
<td>I was just looking and my strength here could be creativity, I enjoy a problem and I can solve it, but as the idea of team that, in a company you probably need those nine guys.</td>
<td>And the number of layers the person is away from the customer, the less bothered they are.</td>
</tr>
<tr>
<td>Show an average on the same graph with a dotted line to let the company to compare how it is performing compared to others</td>
<td>Extended a bit more that dimension</td>
<td>Strategic and operational data Because I would image it would be quite out of phase.</td>
</tr>
<tr>
<td>Focus on implementation Good timing for a some funding on Smart innovation manufacturing</td>
<td>External engagements is defining the market, you got to be creative to develop the product for that market.</td>
<td>Awareness and experience</td>
</tr>
<tr>
<td>Already implemented some recommendations</td>
<td>And then you need</td>
<td></td>
</tr>
</tbody>
</table>
In exploring services, Company A focuses on the affordability of servitization, emphasising the need of looking at the financial aspects. Company A aims to understand the return on investment, from the identification of improvement areas, to the costs of implementation and payback of services. It suggests considering the cost of customer. They want to benchmark other companies with different sizes and different diagrams; it would be useful to show an average on the radar diagram with a dotted line to let the company compare how it is performing in comparison with others.

Company B suggests focusing more on the financial aspects of servitization. They encouraged adding profitability as an extra dimension. To a certain extent the readiness framework could be seen as a company structure (1 dimension = a person, then a department when the firm grows, a hierarchy). For his firm products are the patents and service is the brand. External engagement is defining the market, each company has to be creative to develop the product for that market. Businesses need awareness to be able to get to external engagement.

Company C sees profitability as linked to knowledge and training. Organisations are a community-type collection of knowledge. The Managing Director focuses on both technical (apprenticeship) and behavioural aspects. He notices resistance to change within his firm
because a lot of people seem not seeing the need to change. The number of layers the person is away from the customer, the less bothered they are about addressing their needs. He says that awareness and experience are very important because they are the foundations.
6 DISCUSSION

Previous studies in the servitization literature appear to overlook, *inter alia*, the multiple configurations of offerings, the integration of customers and the proximity to suppliers. Thus, much of the literature regarding the development of services in a manufacturing context offers interventions, suggestions and recommendations that appear to look at barriers and problems separately, thus failing to consider firms as a whole. Firms willing to develop services have to consider that servitization affects the organisation in the way it develops the proposition, requiring an internal process of adaptation in embedding services. SME managers are confronted by a highly complex enterprise transformation process (Boucher and Peillon, 2015), however current studies yet do not explicitly refer to dynamic capabilities for strategy formulation and implementation (Fischer et al., 2010). Manufacturing companies lack the tools to recognise for themselves barriers in entering service and implementing strategy to change internally and achieving strategic and operational alignment. In servitization literature, general guidance is based on successful implementation tracked backward (Finne et al., 2013). Implementation of recommendations on developing services implies an understanding of how the company recognises what works and what does not work for it. In order to fill this identified gap in the literature, interview-based data were collected to answer the following research questions (Chapter 2):

**RQ1** What factors are important for enabling the development of services in smaller manufacturing companies?

**RQ2** How might company experience and capability in relation to these factors be identified?

**RQ3** Can this understanding be configured as an assessment tool for companies?
The output of phase 1 (Exploring) of the research led to the identification of a set of factors that emerged from the literature and the interviews to identify what is important for smaller manufacturing companies for enabling the development of services. Then, results from phase 2 (Deepening understanding) show how the readiness framework was developed to understand how companies’ experience and capability are related to the identified factors. To conclude, in phase 3 (Analysis and outcomes), the implementation of the tool and the company feedback addressed the last question on the configuration of the framework as an assessment tool.

6.1 IDENTIFYING FACTORS FOR ENABLING SERVICE DEVELOPMENT

Although the servitization literature presents successful cases of service orientation that emphasize the creation of revenue streams and profitability improvements over time, service strategies to achieve positive outcomes tend to depend on the configuration of each company’s competences. However, in this thesis it was important to communicate that servitization does not automatically lead to successful implementation of PSS. Fischer et al. (2010) point out that dynamic capabilities differ between the exploitation and exploration of the opportunities when it comes to service business development, and literature remains silent on the actual necessary activities for strategy formulation and implementation. In fact, there is not a predefined transition process for service infusion in SMEs (Kowalkowski et al., 2013). As a result of the heterogeneity amongst firms due to path dependency, implementation strategies have to fit with existing practices, culture and structure. Good-oriented organisations willing to pursue servitization have to become aware of the nature of the change and to identify which are the dimensions to develop PSS and how new strategies fit existing competences.
In line with the constructivist approach taken in this thesis, although companies seek to understand the economic potential and the costs of transaction required by PSS (Tukker, 2004), quantifiable aspects were considered subsequent to the identification of the exploratory dimensions involved in servitization. Phase 1 (Exploring) consisted of an introductory interview with the managing directors to clustering recurrent themes and to the creation of nine dimensions. This exploration began by asking questions on the nature and practices of the development process within the three manufacturing firms. Company A, B and C are in control of the whole development process from the identification of the problem(s) with clients, through the ideation and the creation of prototypes until manufacturing, testing and selling their products. Company A and C follow a formalised development process, while Company B does not have a structured process. In terms of external engagement, each one of the three companies involves suppliers and clients to various degrees along the phases of the development process. For example, Company A usually keeps the ideation process internal to protect intellectual property. Company B, instead, organises itself in a larger stakeholder network for a local farming project. Company B has based its strategy in patents to protect its products and in brands to promote its products and exploit its patents in the market. In servitization, SMEs can take advantage of their higher level of flexibility to organise themselves according to projects (Kujala et al., 2013; Berends et al., 2014). While interviewing the three companies on their practices on how they currently develop new offering and how they identify service opportunities, the relationship between the level of formalisation of the development process and the internal incentive systems related to service development does not seem to impact the readiness to embrace a service-oriented approach in their business. For instance, Company C follows a 14-steps development process that has been refined over the years but it is still at the beginning of the servitization journey. This can be explained because the focus of
servitization tends to go beyond the formalisation of the development process and the categorisation of the offering, and be more related to the willingness of the firm to undertake the journey upon the identification of the in-between steps to take. While shaping the framework, it was relevant to understand the motivations and calls to action of the companies through an understanding of the evolution of their offering. This factor was labelled as ‘service history’ and it was useful to see how this dimension interacts with the other eight dimensions to create new value propositions.

Based on the results of the first interaction with the companies, it started emerging that the focal point of servitization is the notion of service itself that challenges manufacturing companies. Offering services does not only raise awareness in the operations activities in which personnel are asked to possess both relational and technical skills (Mathieu, 2001a) but most importantly it is related to strategic decisions. The managing director has to plan his strategy, supporting and sharing his willingness to ‘serve’ customers across the company’s functions over time. The nature of the business relationship changes, it moves away from a transactional-type of relationship with customers, and engages in a wider stakeholder network. Servitization affects the way manufacturing companies engage with the external world; hence, the creation of the dimension ‘external engagement’ that looks at how businesses sense opportunities and how they extend their offerings. Findings from phase 1 demonstrate that Companies A, B and C have different paths; different configurations of capabilities; ranges of products and networks of stakeholders to relate to and modes of reacting to environmental changes. For a more comprehensive overview of the identification of the factors and the creation of the nine dimensions, Figure 4.3 illustrates the origins and the evolution of the themes into dimensions (see figure 4.3 on Chapter 4 – Developing the readiness framework; Subsection 4.8 – Origins of the dimensions).
6.2 THE RELATIONSHIP BETWEEN THE COMPANIES AND THE DIMENSIONS

The readiness framework has been developed for companies to relate their experience and capability to the nine dimensions. In the Literature review the section 2.5 Tools for servitization describes existing tools grouped according follows: end-state models, gradual transition models and, stepwise progression models; barriers to overcome based on large organization experience (limited number of studies on smaller manufacturing companies); different options in PSS; descriptive models that show managerial implications of this transformation. In the following paragraphs, the readiness framework has been assessed against other tools that the literature offers to show that existing tools do not offer companies a way to orientate themselves in one path or the other; there is lack of tools on assessing servitization from a smaller firm perspective across its functions as a whole to raise awareness on the nature of the change both in the operations activities and the strategic ones.

The deployment of the readiness framework consists of a set of strategic questions that intends to explore and examine the decision-process, the sense of direction and the vision originated by the business owner for his own company.

The readiness framework assumes that firms have no formal service design development process in place; no service designers currently employed as part of the skillset; and, the strategic level guides the operational level. The deployment of the readiness framework required three steps: completing the questions along the nine dimensions, translating them into radar diagrams and creating a set of recommendations on the actions to take.

First, companies are asked to answer questions on factors that are critical in the transition from manufacturer to service provider. Second, the answers are translated into a qualitative scale in the
radar diagram. To conclude, the visualisation of the results facilitates an internal conversation based on the identification of where the firm sits and where the firm wants to be (introduced in the ninth dimension: awareness). In phase 2 (Deepening understanding), the readiness framework was deployed at board level and operational levels responded to the need for exploring the business as a whole in terms of a firms’ activities and priorities. Shivakumar (2014) introduces a framework to describe the decision-making process within a firm with the purpose of identifying how firms make commitments (that are firm-specific) and how these companies manage their scope (that is usage-specific). Since service orientation is not just about adding operational steps to provide services, but raises strategic issues, this study takes a broad approach to understand how companies are organised to respond to market needs. Reflecting on the object of service design, on the nature of service as interface between providers and clients leads to a redefinition of designing services with other disciplines (Secomandi and Snelders, 2013). The readiness framework creation process contributes to the redefinition of design as a reflective practice. It is worth noting that in the same way servitization challenges small manufacturing companies, the design of service affects the way current product designers conceive, develop and communicate integrated solutions. The literature offers definitions of servitization that emphasise customer-centricity to deliver desired outcomes for the customer. This requires practices and attitudes to be challenged for service design, organisation strategy and organisation transformation for conventional manufacturers (Baines et al., 2009). Many authors suggest to creating separate customer facing units within organisations (Oliva and Kallenberg, 2003; Davies, 2004; Brax, 2005; Gebauer and Friedli, 2005). However, results from the interviews show that Company A, B and C do not have separate service units. In Company B and C, relationships with other customers and other companies are usually developed and
maintained by the managing directors themselves. When developing a solution, Company C describes the relationship between buyer and seller in B2B context using the “bow-tie” model with layers in-between decision-makers and users. For instance, R&D engineers of the manufacturing company deal with the R&D of the purchasing company, tending to neglect the operator (end user) in the development process. In brief, the customer centricity of manufacturing companies alters current practices and attitudes and the establishment of a service culture with customer-facing functions (Dinges et al., 2015). Company C raises the issue of time spent with the client to frame issues and design review meetings. Company A and C acknowledge task-based engineers focus on technical details, therefore making the absorption of the service notion harder to grasp. However, the proximity between strategic and operational levels in creating and maintaining relationships with suppliers (and peers) and customers (e.g. the MD is involved in those activities) plays a critical role in the transition and implementation of the service mindset and in understanding how the firm repositions itself in the supply chain.

6.2.1 THE NINE DIMENSIONS AND HOW THEY WORKED

The order of the dimensions suggested in the framework showed a useful way for respondents to start talking about their firm’s past achievements; the experience gained; the configuration and evolution of the offering; the way the offering is built; the collaborative environment; the sources of innovation; the degree of openness of the firm with the external world; the flow of information; and, the vision of the future. All the dimensions are intertwined to suggest a particular order to frame past processes and plan future strategies in PSS. The service design readiness framework helps companies to identify the dimensions to extend to develop PSS. The deployment of
the framework shows interdependencies among the dimensions. Although the sample is limited to three companies, it can be inferred that some of the relationships are firm-specific and context-dependent and some of them occur across the firms. For instance, Company B argued that external engagement is essential in firm’s development and this is supported by the leading role that the firm is playing in the farming project. Within Company B’s laboratory, creativity is fuelled in the prototypes and products developed. Company C recognises awareness and experience as foundations of its firm. Company A looks at experience and effectiveness as key dimensions where competences are translated into profitable products and lines of products. Overall in the three manufacturing firms, experience is considered the most critical factor, if not the only one, causing resistance to services because of design practices already in place and tailored around products. The resistance to change is assumed to stem from the absorption of the service notion within the company from top to bottom; the existence of a shared definition of service and how service value is expressed throughout the functions. To an employee of the shop-floor level of Company B, the notion of service was not always clear. The technician has been working in the company mainly in product-related tasks and distanced from the end user, therefore not directly exposed to clients. The CEO of Company B pointed out that creativity is expressed by putting together patents for products and has to be linked to the image of the company, to its brand and the service across the company. The interaction with the manufacturing companies involved in this thesis added new levels of understanding of how the dimensions are perceived beyond the purpose they were developed for. For instance, communication can be read as internal and external too (brand reputation/recognition, how to promote their offering). The way culture and values are shared internally within the company reflects the brand reputation and recognition from outside. When discussing its participation in the farming project, Company B claimed
that it was chosen for its stronger brand image over another firm. In the service design context, Clatworthy (2012) confirms the importance and the need within organisations to align customer experience and brand. Company B recognised external engagement as key dimension at the outset of a new project to frame and define the issues (as in the farming project). This can be explained by the multiplicity of perspectives involved and the expertise that each stakeholder brings to the project. Davies (2004) states that high-value integrated solutions originating from the combinations of products and services are the results of moving downstream and upstream in the supply chain. Company B is shifting to integrated solution moving horizontally in collaborative projects to create new market extensions. The findings of the interviews capture the complexity of business, the relationships with the external world and the balance between culture, communication and competence to be effective in the market.

Created as a tool for triggering conversations, the readiness framework illustrates that from firm to firm there are a number of relationships between dimensions. It can be discussed to understand the causes and effects of one dimension upon the other. Future research could investigate the nature of the relationships among dimensions, if business-related or project-related.

Below are some of the relationships that emerged through the analysis of the interviews.

**Effectiveness – Experience**

Build on past successes (how reputation is built, e.g. word of mouth, working prototypes Company B), learn from failures to improve (challenging products, one-off products) the offerings.
Effectiveness – Service history – Experience – Awareness

The link between them demonstrates how the firm resists and creates resilience in the competitive environment. In order to be effective on service, a wide experience on products in market is needed to achieve servitization (as confirmed by Company C and the maintenance contracts of their own machines).

Experience – External engagement – Culture and development

In Companies B and C, the role of the entrepreneur (background, skills and attitude) is fundamental for the future of the company from day-to-day choices to long-term vision. Staff are hired and brought in based upon a firm’s expertise and past experience that create a benchmark for upcoming projects.

Experience – creativity – culture and development

Board level staff and employees at operational level recognise the value in the flexibility and variety of tasks (size-dependant characteristics) resulting in professional development. Culture and development set up the environment where experience is gained (employees feel they were given the opportunity in Companies A, B and C) and where people are encouraged to explore new ideas (Company B).

Service history – Risk propensity

For Companies A and B, understanding the benefits of servitization involved understanding the portfolio of past products and related economic benefit compared to the risk propensity of new value propositions with uncertain payback period and economic reward.
Service history – Risk propensity – External engagement

In the deployment of the readiness framework at operational level in Company B, it was claimed that a high degree of openness with other stakeholders and the complementary competences with suppliers had a positive impact upon the project. However, small manufacturing firms may face IP protection issues of co-created products in open innovation projects.

Service history – Communication - Culture and development – Awareness

The willingness of starting a new challenging project impacts the way it is communicated, how people are given the opportunity of understanding the value in it and buy into it (as in Company B). Shared values in the firm inform new competences and drive change. Conversely, the board level has to overcome internal resistance to change (the MD of Company C assumes engineers’ resistance to starting to develop services).

Awareness – Experience

Past experience and best practices in manufacturing products influence the way services are framed and understood internally. The deep knowledge of the market firms are working in and for (Company B and C) with the determination and sense of direction of the board level (Company C) are the foundations for change to happen.

Communication – Creativity

The way information flows within firm informs the development process and the decision making process. Company A and B
recognise the family-like relationship in which formal and informal information across functions and departments nurtures collaboration and dialogue in that working environment. Company A talks about “a friendly rivalry among departments”.

Communication – External engagement

The type of information exchanged sets up the environmental working conditions of employees. For instance, project-related information is collected from different sources such as design reviews, on site visits and contributes to the final output. Business relationships between smaller firms and clients are important to understand and respect the project timeline and the final outcome. Who is talking to who? How are project-related information/decisions discussed and who with?

Experience – Culture and development - Communication

The imprint of the business owner (Company B and C) influences the way project-related information is circulated and how culture is nurtured by other business-related activities.

At board level, staff across the firms point out the importance of communication; the flow of information within the company, and the involvement of staff beyond the development team to collect insights. At board level people are aware of their dual role of interfacing with customers and internally among employees. The role of the managers is to identify strengths and weaknesses in the team and keep motivation high, and holding the different parts together (Company B and C). At operational level, in Company A, the Operations Director and his department feel they are a conduit between the customers outside and the engineers inside. Information from sales
representatives, contractors, and customers create awareness of customer frustrations early in the process. This information leads to improved service offerings. Company A has an on-going refinement process of tracking and measuring performance based on individual daily targets. In Companies B and C, the employees interviewed described a sense of belonging to the current firm due to the diverse tasks and experiences they are offered. The managing directors of Company B and Company C are sources of ideas and taken as an example presenting a sense of advancement. In Company C, the workshop supervisor recognises that communication in his department can be improved and looks for higher levels of involvement from the workshop at the outset of the design process.

The purpose of applying the framework at both strategic and operational level was to consider the hands-on experience of day-to-day routines. Radar diagrams for operational engagement are not represented. However, for the research, the answers at an operational level were very useful in assisting the author in gaining a deeper understanding of each of the firms.

In the following sections a description of the strategic level and the operational level are presented to highlight the patterns among the three companies.

### 6.2.2 Analysing the Findings from the Readiness Framework

Table 6.1 below summarises how the evidence of Companies A, B and C are related to previous studies in the literature.
<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Evidence in Company A</th>
<th>Evidence in Company B</th>
<th>Evidence in Company C</th>
<th>How it relates to the literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Effectiveness</td>
<td>Leading the ventilation system market</td>
<td>Clients among large company</td>
<td>Clients among large company</td>
<td>Successful factors and performance criteria; Path dependence; Product superiority</td>
</tr>
<tr>
<td></td>
<td>Performance measure in sales of products</td>
<td>Evidence-based success (demonstrate the working prototypes)</td>
<td>Every project is a launch</td>
<td>Eisenhardt and Martin, 2000; O’Reilly III and Tushman, 2004; Baldwin, 2003; Teece, 2007; Löfberg, 2014</td>
</tr>
<tr>
<td>#2 Experience</td>
<td>Formalised development process</td>
<td>Focus on prototypes: learning by doing</td>
<td>Formalised development process</td>
<td>Tacit knowledge; Configuration of the development team; Background of the MD and expertise</td>
</tr>
<tr>
<td>#3 Service history</td>
<td>Successful projects from special</td>
<td>From selling plant to selling water treat per hour as an extension of what they did</td>
<td>From selling machines to offering maintenance contracts</td>
<td>Lead users; Going downstream; Origins of the revenues; Evolution of the offering in PSS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>de Brentani, 1991; Davies, 2004; Kindström and Kowalkowski, 2009; Avlonitis et al., 2013; Paiola et al., 2013; Baines et al., 2013; Kowalkowski et al., 2013; Dotzel et al., 2013; Löfberg, 2014</td>
</tr>
<tr>
<td>#4 External Engagement</td>
<td>Internal capability to develop new solutions</td>
<td>Part of a project in a stakeholders network within the local farming community</td>
<td>Involvement in boards and programmes (business activities non project-related)</td>
<td>Supply-chain and non supply-chain relationships; Relationship with large companies and niche markets; Open innovation</td>
</tr>
<tr>
<td></td>
<td>Business activities non project-related activities</td>
<td></td>
<td></td>
<td>Davies, 2004; Prahalad and Ramaswamy, 2004; NESTA, 2007; Payne et al., 2008; Verganti, 2009; Grönroos, 2011;</td>
</tr>
<tr>
<td>#5 Culture and development</td>
<td>Friendly rivalry among departments</td>
<td>Core of the company has been working there for 15-20 years</td>
<td>Room for improvement. Making mistakes only ONCE</td>
<td></td>
</tr>
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<td></td>
</tr>
<tr>
<td></td>
<td>Family-owned business</td>
<td>All people involved in the development process and ownership of the ideas</td>
<td>Professional development and people attitude</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Companies are people: behavioral characteristics over tasks</td>
<td>Staff capabilities; Absorptive capacity; Product development and transformation; Sense of belonging and pride</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Baldwin, 2003; Davies et al., 2006; Gebauer et al., 2010; Martinez et al., 2010; Acklin, 2013; Paiola et al., 2013</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>#6 Creativity</th>
<th>Product proposal form</th>
<th>Everybody comes up with different suggestions all the time</th>
<th>Engineers design functions, task related job (lack of independent exploration)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sources of innovation; Working conditions and facilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Eisenhardt and Martin, 2000; Teece, 2007</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>#7 Risk propensity</th>
<th>Shortest payback</th>
<th>Embracing novelty: highly encouraged</th>
<th>We would like to start with the end in mind. We are not familiar with not knowing what the next step is.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Do we need a service?</td>
<td></td>
<td>Risk aversion and perception</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Kahneman and Lovallo, 1993; Eisenhardt and Martin, 2000; Avlonitis et al., 2013</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>#8 Communication</th>
<th>At senior level it’s always some confidential information.</th>
<th>We’re always interfacing. All our information is all shared in the same place so it’s easy to access when and where.</th>
<th>Regular meetings with the MD and functions’ supervisors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Whenever they have regular meetings there is regular communication down to the team.</td>
<td>Not good enough, no internal communication.</td>
<td>Formal and informal information; Project-related information exchange</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Normann and Ramirez, 1993; Payne et al., 2008</td>
</tr>
</tbody>
</table>
| #9 Awareness | Service design is not just designing a new service. | Entering the utility market | We have to build how to maintain the machine | Sense of direction; Understanding and knowing the customers; Value constellation
| Manufacturing is not just making one thing in one place. | Other applications | Managing the growth | Chase, 1978; Parasuraman et al., 1985; Bitner, 1992; Normann and Ramirez, 1993; Morelli, 2003; Davies, 2004; Brown, 2009; Ates and Bititci, 2011; Bailey, 2012; Madden, 2013; Acklin, 2013; Avlonitis et al., 2013 |
| | Managing the growth | |

Table 6-1 Summary of findings per company per dimension
According to the results, Company A offers product-oriented services, as shown by the 99% of the turnover that comes from the purchase of their ventilation systems (as stated by the Marketing Director). Company B offers a result-oriented PSS since their offering is based on the function of the product that demonstrates the amount of water treated per hour. Technology and digital tools informed the way the offering is created and the way firms are building a dialogue with customers. Company C is still at the very beginning of the servitization process. In this thesis, the three radar diagrams indicate three different shapes and identify how firms are in very different stages of the servitization process. Each company has a different culture; different ways of managing people; and different configurations of capabilities, offerings, networks stakeholders, and propensity to act and react to changes in the competitive environment. This is also confirmed with the findings from previous studies that demonstrate that there is great heterogeneity among smaller firms in terms of what they produce, what their customers produce, and the type of business network to which they belong, which results in the wide variety of possible value constellations (Kowalkowski et al., 2013). In fact, the readiness framework with the nine dimensions considers the variability of configurations from firm to firm.

In this study, Companies A, B and C showed some uncertainties, lacking confidence in the economic justification for service development. For instance, from the first meeting Company A had assumed that developing services costs more than producing products (based on past experience not precisely described). Company A wants to maintain its identity as a ventilation systems’ manufacturer. This is also reinforced by the fact that engineers and employees of the workshop, far from the end users, do not see evidence of value in addressing soft aspects. Similarly, Company C, less inclined to take risks, argues that although the Managing Director
feels confident in his company’s capabilities to start servitization (technical and product-based skills); he asserts they lack the infrastructure to develop services. The Managing Director of Company C explicitly states that his employees are task-oriented and not passionate enough in their jobs to embrace the change.

Table 6.2 below presents firms’ perceptions of servitization.

<table>
<thead>
<tr>
<th>Motivation behind servitization</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Company A</strong></td>
<td>Previous involvement in the service design programme resulted in a better decision-making process in the firm and an improved development process at the front-end. They are currently looking for evidence on the economic side of sharing and developing a service approach across the company.</td>
</tr>
<tr>
<td><strong>Company B</strong></td>
<td>Previous involvement in the service design programme resulted in result-oriented offering with a remote control that empower the customer with some of the plant functionalities. They are involved in an open innovation process with other stakeholders involved in the treatment of treating water and drying waste in the farming community.</td>
</tr>
<tr>
<td><strong>Company C</strong></td>
<td>Beyond profitability and the standard KPIs, the MD is sensing the need of exploring the behavioural implication of the individual within the firm and how it reflects on the perception of happiness within and outside the firm. The managing director, involved in a number of activities mainly on creating and maintain relationships with clients, is looking for involving employees leveraging on their attitude and not only on their tasks. It is also being asked to develop a contract-based maintenance contract from one of the client.</td>
</tr>
</tbody>
</table>

Table 6-2 Firms’ perception of servitization in practice

Previous involvement in the Service Design Programme may explain why in design case A there was some familiarity in using service design tools (e.g. personas, customer journey maps and blueprints) to make decisions when developing a new product, testing its feasibility and desirability. Further, they implemented some of the recommendations advised when the service design government-funded programmed finished. Company B, aware of the economic benefits of selling functionality and control of the water treatment plants, implemented both the recommendations given by the service design programme and the ones recommended in the report.
In contrast to the previous two case studies, Company C is raising awareness on the impact that behavioural aspects have at individual level in servitization. While in the past technical competences were the only ones required to solve problems (therefore the task-based activities engineers have to perform). Nowadays, either for external motivation due to new competitive landscape or clients’ inquiries, companies have to recognise the influence of employees’ attitude when dealing with clients in the design reviews (e.g. time spent with them, values and priorities of the two companies). Manufacturing companies have to start engaging more often with customers going downstream (Wise and Baumgartner, 1999) or with suppliers (going upstream: vertical integration) and evaluating that the source of innovation can lie outside this also (Laursen and Salter, 2006) for instance, looking at lead users (Von Hippel, 2005). Chesbrough (2010) asserts that SMEs play important roles in the open innovation world, sensing opportunities that emerge from the periphery of a market, that is relative to large firms. Open innovation activities encouraged firms to cultivate multiple customers in multiple markets, spreading costs and risks of adoption. In the servitization context, integrated solutions developed when a firm changes position in the value-stream by moving upstream or downstream, requires the development of new capabilities (Davies, 2004). Strategic decisions in undertaking servitization require change in competency.

In Companies A and C, the legacy on ‘making’ and the distance between clients and engineers impact on the types and ways information and data internally circulate. Formal and project-related information neglecting usability and context in use defines a myopic identification of problems based on technical aspects. By contrast, a customer-centric approach promotes a relational model with the firm over time co-developing solutions.

Despite it often being reported that smaller firms lack formalised processes (Berends et al., 2014), this is obviously not always the
case, and both formal and informal structures were found across Companies B and C. Company B does not have a formalised development process, a product proposal form or suggestion system as incentives for employees. While Company C follows a 14-stages product development process as result of knowledge codified over years. As organisations grow, they move across evolutionary and revolutionary stages with managerial problems and practices rooted in time (Greiner, 1998). The role of the entrepreneur is critical (Acklin, 2013) as shown in smaller firms such as Companies B and C where the business owners instil their background, their values, and skills impacting the firm. When the value system is internally shared, employees feel a sense of pride and belonging to a smaller firm and appreciate the flexibility and variety of tasks. Workshop staff of Companies B and C feels they have been given the opportunity to advance professionally.

Although in different ways, Companies A and B are deploying service design as a strategic approach not just to add services but to create better value propositions (e.g. improve the product development process to make better decisions; better work-flow in the workshop and working conditions). No formalised development process for services are in place in the three companies.

Previous studies (Vargo and Lusch, 2004b) support the view that manufacturing companies have strong identity and legacy in ‘making’ that originates from the product development process; it reflects the relationship with customers and the way an offering is promoted. But services present a different scenario from products (Mattsson, 1994; Cook et al., 2002; Secomandi and Snelders, 2013) while other authors (Hollins and Hollins, 1991) consider the early stages of product design and service design processes very similar at the front-end. However, the debate on the boundaries between products and services is related to managing and designing (Boland et al., 2007); major problems and pitfalls for the entrepreneur starting a small
business are exactly the same as for anyone designing a new product or system (Hollins and Hollins, 1991).

Servitization within smaller manufacturing firms is a dual challenge that consists in reconfiguring the offering while reconfiguring the firm itself. In understanding readiness factors of servitization, on one hand the manufacturing firms involved in this thesis possess competences and expertise to continue producing quality goods. On the other hand, the entrepreneurs are constantly dealing with design and organisational problems. Service introduction redefines the relationship among the firm, customers, suppliers and other stakeholders. For instance, Company B recognised the increased proximity with customers and other stakeholders as it occurred in the farming project. The external engagement dimension is a critical component for service development. Effectiveness and culture are tightly linked. In order to perform successfully, firms have to get people to buy into the development process. Companies B and C perceive that service introduction and company growth rely on hiring the right people to grow new competences. When discussing staff development, Company C valued the community-type of learning where employees are exposed to task-related and behaviour-related experiences and can benefit from the learning environment. However, this is based on the past experience of the MD during his apprenticeship in a large company and hardly fits with his firm’s reality. General training and apprenticeship schemes are not answering the need and priority of small firms in advancing company skill sets in a limited period of time. Company C considers itself ready in terms of capabilities but lacking infrastructure to be servitized. This may be explained by the systemic level of intervention required for service design (Gummesson, 1990; Morelli, 2002).
6.3 THE READINESS FRAMEWORK AS AN ASSESSMENT TOOL

The deployment of the readiness framework and companies’ feedback resulted in a reflection on how the companies responded to the tool and suggestions to implement it. The rationale behind the readiness framework is to enable manufacturing firms to assess themselves to undertake implementation steps in servitization. Answering the questions of the readiness framework and reporting them in the radar diagrams gives each firm a visual representation of the company’s performance related to services. The application of the framework can be translated into a set of recommendations to improve service awareness. Servitization framed into these nine dimensions allows smaller manufacturing firms to turn strategies into small actions, understanding the nature of change required (Ates and Bititci, 2011). Established companies have to raise awareness on what design practices to keep and what to unlearn to embrace a service-oriented approach. Although strategy and operations are closely aligned in Company B and C, it may be inferred that proximity between managing director and workshop (and across functions) facilitates the circulation of general and project-based information; however communication tends to be firm-dependent and culture-driven. Strong and inspirational leadership permeates internally across the functions to instil the firm’s values with the ultimate result of creating company culture and identity (more emphasised in Company B); and also externally to create and maintain direct relationships with clients and customers to co-create better solutions (emphasised in Company C). In the readiness framework, the effectiveness and experience dimensions evaluate how the firm became what it is today and how experience was gained.

Across the three companies, growth ambitions are the key drivers of the managing directors in addition to competing in mature markets, and the need for diversification. Results from the interviews with the
managing directors of Company B and Company C show that, as the firm grows, they struggle to hire the “right” people with the required skills to unlock the right configuration of competences of the organisation as a whole. The three design cases showed that a strong design manufacturing legacy was identified as one of the hurdles to overcome. This is in line with Junginger (2015) because manufacturing firms are full of design practices rooted in the company way of doing and operating and deeply embed in the company functions. Companies A and B perceived that they have gained positive outcomes from deploying service design (e.g. previous involvement in the Service Design Programme see Chapter 3 – Methodology; Section 3.2.3 Design Cases’ selection strategies). This probably stems from the previous involvement of Companies A and B in the Service Design Programme. Although Company A wishes to maintain product-based offerings and not develop services, it recognises that service design helped them to make better informed decisions in their product development process. The deployment of the readiness framework by Company A at strategic and operational levels showed that services are seen as a means to push product sales. However, the high risk aversion of Company A is historically rooted in unsuccessful implementation, they perceive service development to be more expensive to set up compared to producing and selling products. Thus, for Company A there is a lack of evidence of the economic benefits of servitization within their firm, making them reluctant to take further steps in the servitization route.

The reflective practice of small manufacturing firms involved from discussing the brief with the clients to deliver a solution, resembles the creative process of service design deployed in this research. The managing directors of Company B and C covered strategic and operational roles at the same time, ever since the firm was founded. To link theory and practice, the notions of service and design have been examined and this established the foundations of the readiness
framework. It was found critical for manufacturing companies to recognise where they sit in the servitization journey at the outset of any strategic decision to be made about the future of the company.

In product development, many authors assert that up-front consideration of end-users assists throughout all development stages (Reid and De Brentani, 2004; Achiche et al., 2013). Similarly (Hollins and Hollins, 1991; Clatworthy, 2011), indicate that considering servitization from the outset of development leads to the creation of more complete and valuable offerings.

Between the deployment of the readiness framework and the presentation of the results and guidelines on improving their service implementation, Company B had already implemented the recommendations formulated in the report. This can be explained by the firm’s commitment in achieving the goals they set themselves months before in previous interviews. Readiness for change, although an individual-level construct, requires a consideration of the organisational context (Jansen, 2000).

Following the meetings with the Marketing Director and the Operations Director of Company A, when delivering the report and presenting the results, a certain resistance to change was still noted that may stem from the core senior staff at the board level that has been working there for 15-20 years (as the interviewees said in the last meeting). Despite the bigger size of Company A, the Marketing Director describes the firm as performing like an entrepreneurial family-owned business, with a culture very focused on cash, income generation, and led by short-term priorities. He is currently questioning if culture is the only thing that influences innovation in servitization. Another reason for the lack of confidence to take steps toward servitization may originate from the low risk propensity of the firm to finance projects and services without knowing in advance the economic benefits from them. Being that Company A is successful,
they do not feel the need and the pressure to change internally and compete with services. However, the Marketing and the Operations Directors showed interest in understanding how services help to get closer to customers and increase profitability. This perspective opens up the discussion to investigate which are the factors that apply to manufacturing companies willing to commence the servitization journey, putting them in context and showing the multifaceted aspects that a firm has to go through. During the interviews, the Marketing Director of Company A did not mentioned services offered by other competitors. The explorative nature of this research examines each of the participating firms which are in different sectors. Information regarding the commoditisation of each firm’ sectors and services amongst competitors are based on the respondents’ answers on the product they offer, the market they are working in and the relationships with competitors and suppliers.

Company B experienced a different approach to services because it was somehow implicit in the firm, the service designer they collaborated with from the Service Design Programme, made the need of offering services more relevant to them in terms of experience with the customer in maintenance aspects and in economic benefits they could achieve. Instead, Company C is approaching servitization to respond to one of its client’s inquiries to formalise the maintenance contract on the machines the company produce and install. Although the Managing Director is becoming interested in understanding and promoting the customer-centricity approach related to servitization, he believes that engineers may possibly hinder the service implementation change of the offering.

Further, in the review of the literature, the majority of studies report board level perspectives of servitization that - although fundamental - is partial in the sense that data usually represents senior level managers and directors’ points of view exclusively. In this research, thanks to the nature and structure of smaller companies, the choice
of interviewing shop-floor employees resulted in integrative and complementary information to those of the MDs. For instance, in Company B, employees working at shop floor level provided details on a project that impacted the way the firm organises itself with other stakeholders to tackle water and waste treatment for farming. Opening up to other local bodies and companies and taking part in a bigger network for a local collaborative project puts Company B in the position of lead expert in that context or network. Similarly to Company B, Companies A and C illustrated how external engagement with clients and suppliers plays a role in developing their business further.

The deployment of the framework at an operational level showed that the order of the dimensions facilitated new emerging topics and the addition of further details on how firms work. This helped interviewees at operational levels provide useful examples to create more vivid pictures of the companies. Workshop staff related to past experiences in other companies to provide useful information and comparative examples to recognise their current company’s values and achievements. It was found that the readiness framework enabled a conversation that started from past achievements framing the elements to build the vision of the future providing current and real examples based on the relationship with clients (Company A, B and C). In all three cases, the companies engaged with servitization in different ways, driven by different motivations and resulting in different impacts.

Company A claims that service design tools have been used for improving the business focus, to make better decisions and to manage the company internally. Although service design tools had an impact on product development, Company A still does not explicitly consider developing new services or integrating them into the current product development process. Company B started integrating services once they understood the commercial benefits of
servitization. It started considering the shift from product to services as an extension of their business with the aim of entering the utility market. In Company C, despite a lack of prior formal knowledge in service design, the Managing Director has started focussing on soft aspects such as happiness of customers and employees to measure performance beyond the logic of profitability. This included the perception of customer satisfaction beyond the standard KPIs. He is currently finding information on how the customer-oriented approach can benefit his business. Further, he has been explicitly asked to offer maintenance contracts on their machines by a former client.

When the results were shown to the three manufacturing firms, they recognised themselves in the radar diagram. However, Company A suggested benchmarking other companies in the same sector to indicate an average as a means to compare how it is performing compared to others. Further research may shed light on the relationships of the dimensions, investigating weights and priorities amongst them. Company B, the CEO recognised that the external engagement dimension has extended over the last months thanks to involvement in a project that connects them to local authorities, farms and other stakeholders to work together and find solutions for the agricultural sector. In this project they offer their expertise in treating water and drying waste which is a new competence acquired through the farming project in which they are involved. Following promising preliminary results, Company B is also encouraged to explore how to generate electricity from waste and to enter the utility market.

According to the set of data collected and analysed, the nine dimensions identified for manufacturing firms to frame their business can represent the competences needed in the transition from product to service. Company B suggested reading each dimension as a task or attitude of a person. So, as the company grows the dimensions becomes offices, departments and the number of people in the
company increases. The CEO, positioned at the centre of the radar diagram, is in control of his employees and their tasks.

6.4 APPLICABILITY OF THE READINESS FRAMEWORK

The readiness framework as an assessment tool is intended for smaller manufacturing companies who are becoming interested in creating services. Developing a service-oriented approach as an extension of the existing activities and offering integrated solutions, the readiness framework is a meta-model that helps these types and sizes of firms to frame the challenges of servitization. In this thesis, the readiness framework is not presented as a new development process. However, its approach can be closer to the stepwise model that focuses on the dimensions smaller firms must reach in order to provide higher levels of servitization. Manufacturing firms need to get closer to customers to achieve this. Each dimension is meant to frame the nature of change, what Ulaga and Loveland (2014) refer to when discussing the magnitude of change for service-led growth. Critical for them is the absorption of service notion and the relevance in the firm. Service-oriented approaches demand the creation and the maintenance of closer relationships with customers. In terms of external engagement, in this study, companies interface with contractors and installers to promote their products (Company A); directly with clients in a wider stakeholder network for a project on water and waste treatment in farming (Company B); and, clients from other industries (Company C refers to the bow tie-like relationship with the client: who within each of the companies is talking to who).

Products have to be repositioned; and services are the joints between customers and operators that occur in servicescape (Bitner, 1992) service encounters (Mattsson, 1994), interface (Secomandi and Snelders, 2011; Secomandi and Snelders, 2013). Developing services
requires an increasing component of human issues (Cook et al., 2002), hence the behavioural implications as introduced by Gebauer and Friedli (2005).

The purpose of the readiness framework is to understand how smaller companies work; what their creative processes look like; the source of innovation; the role of design itself. The results of the readiness framework are firm-specific and are based on a company's input. The readiness framework does not look at the process but at the very front-end issues to frame, making the firm aware of the nature of the changes when deploying a service-based approach to PSS. As the company grows it faces phases of evolution and revolution (Greiner, 1998). For firms to become ambidextrous organisations (O’Reilly III and Tushman, 2004), incremental and revolutionary change is required. And this fully applies to manufacturing firms willing to grow by services. The readiness framework is a model that attempts to encompass the different components of servitization in smaller companies. It was created taking a strategic approach because service positioning through structural change (Shostack, 1977; Shostack, 1987) and recognizing the service function as a holistic management concept, should allow managers to map where the service activity can take place (Kowalkowski, 2011). The alignment of strategy and operations is critical since services impact daily activities and structural change (Bailey, 2012). Risk propensity as the capability to react to and embrace uncertainties is the biggest barrier to overcome, and although it is presented between creativity and communication, it aims to make managers aware of the internal hurdles or level of propensity they have towards investments in services. Based on the previous dimensions manufacturing firms (managers) may realize that services are not just adding some intangible features to the products but they involve much more effort to benefit from in the long-term.
The readiness framework evaluates the current position of smaller manufacturing firms in servitization because service strategy formation and implementation depend on firms’ value chain position and their business environment (Gebauer et al., 2010). Challenges in this transition are not just determined by the lack of resources; despite the size of the companies, small firms choose to build some capabilities internally, choosing outsourcing or partnerships for other capabilities. The conceptual framework focuses on the internal firm’s readiness and offers a tool to empower firms along nine dimensions. Although the readiness framework is not a maturity model, where a company undertakes the framework analysis at various stages of their development, they should be able to identify any evolution of their company. Building on the intrinsic characteristics of SMEs, Ates and Bititci (2011) see the change process as a key enabler for building resilient SMEs. Further, their sustainability and resilience will be enhanced by: the ability to embrace organisational and people dimensions as well as operational aspects of change management; paying attention to long-term planning and external communication to drive change proactively. But change and culture management seem to be viewed separately in SMEs. Since culture management is driven by rewarding employees and internal communication activities. Change management practices mainly focus on implementation. Planning, preparation and embedding change seem to be less emphasised. Change management practices are primarily internally focused as evidenced by the limited relationship management with external stakeholders such as customers, suppliers and competitors. Little or no attention is paid to communicating with customers, competitors and suppliers in managing change and culture. The framework presented in this thesis is intended to assess readiness as preparation for change. As the company faces servitization, communication and external engagement start to become more central. The different shapes resulted from the readiness framework deployment attest that each company follows its path and what they
are is based on their path-dependency (Eisenhardt and Martin, 2000). The nine dimensions and the firm-specific relationships offer smaller manufacturing firms a way to identify their meta-capabilities to face servitization. The evaluation of the readiness framework against other existing models confirms that three critical aspects are taken into account. Firms willing to grow by services creating repeatable solutions have: to consider their size-dependant and contextual characteristics; to develop a customer-oriented attitude; and, to raise awareness on their limitations of product design practices in service provision.

The readiness concept can be interpreted as follows: readiness of company to move into service business, beware of keeping them separate (Brown et al., 2009); embedding service design and design readiness (Bailey, 2012); in a larger scale, market readiness and organisation readiness (Storbacka and Pennanen, 2014). Built on the intrinsic characteristics of smaller manufacturing firms, the readiness framework has been developed as a comprehensive conceptual model with a set of dimensions that describe the critical factors of a firm involved in the servitization process. Results of the radar diagram represent the current firms’ status in developing services across the organisation as a whole and they offer a strategic tool for the manager or director to reflect on the dimensions as functions to extend to reach higher levels of servitization. It is not a retrospective tool although effectiveness and experience report the past, awareness is a trajectory for the future. In order for smaller manufacturing firms to develop service-oriented offerings, it is essential for these organisations to understand the customer-orientation (Payne et al., 2008) and co-creation process in services (Blomberg and Darrah, 2015).

Existing studies provide descriptive tools that do not effectively explain where firms should start implementing those strategies. Oliva and Kallenberg (2003) claim that the transition occurs in stages and
they introduce a developmental approach based on capabilities. They consider two dimensions that are related to the nature of the offering (which in the readiness framework is represented by the service history) and the type of relation desired or resulted (external engagement). They suggest to measure the outcome internally (to provide a clear sense of direction) and externally (reputation and reliability of the brand). The readiness framework expands to other dimensions such as the experience, culture and development that can serve as guidelines for the HR process to identify the capabilities to look for and to match with the firm.

Building on Davies (2004) the importance of repositioning the firm in the supply chain to develop integrated solutions raises some issues on the assets and infrastructure that services require and the question of building in-house capabilities or buying them in. He says that when a firm changes position in the value stream - by moving upstream or downstream - it must develop new capabilities. And the nine dimensions identified in the framework can assess those capabilities or functions and the desirability of the new position to reach for each of them. He advises to have a feedback loop between design and operations, and this was one of the recommendations for Company A where it was suggested to use customers’ complaints in combination with the service design tools to improve NPD. Initial success of the company is represented in the effectiveness dimension. The concept of firms' productive or market base, discussed earlier, suggests that there is a "centre of gravity" in the value stream arising from a firm's initial success in the industry in which it grew up (Galbraith, 1983 in Davies (2004)). The readiness framework responds to Davies' conclusions for further research on the variety and frequency of changes in strategies. The readiness framework is an attempt to bridge the value of the customer and the needed culture, infrastructure and network. When comparing this framework to the main categories and subcategories of PSS by
Tukker (2004), it was questioned if it can be considered a performance indicator for functional PSS along the nine dimensions identified.

If servitization occurs in stages Oliva and Kallenberg (2003) and the incremental approach is inadequate (Brax, 2005), the literature does not offer a unique way to describe servitization. Characteristics of behavioural processes within successful and unsuccessful companies have been identified by Gebauer and Friedli (2005) and they informed some of the dimensions. The descriptive models analysed claim for closer proximity to customers and customer-centric thinking, however they lack of modes of intervention. To fill this gap, service design mapping tools put users at the centre and visualise the system and how it works. In their process framework for developing industrial service offerings, Kindström and Kowalkowski (2009) value visualisation strategy as a key component in service transition and implementation. The interaction and intervention of the researcher impact on the framework being developed. This was pointed out by Brax and Visintin (2016) who claim that existing models are shaped according to the access of the information to the researcher, for instance most cases report on what the firm did in the past using a retrospective and interpretative approach. Recent studies reveal that servitization is not a unidirectional process and that a multiplicity of paths is presented to define service-led growth trajectories (Finne et al., 2013; Ulaga and Loveland, 2014; Kowalkowski et al., 2015). Heterogeneity amongst firms and across industries is shown by the different paths and configurations of capabilities of the firms involved. However, the assessment tool intends to overcome the divergent experiences offering a tailored map of the dimensions that characterise the transition from product-based to solutions and result oriented offerings.
6.5 ITERATION AND LEARNING PHASES

Results of the previous chapter suggest that engaging with companies is fundamental to demonstrate that the deployment of design skills to co-create new interventions needs to be strategic in nature. These skills demand understanding beyond the usual remit of design in order to effectively facilitate long-term organisational change. At the outset of this study, service design was considered for its practical and hands-on contribution to visually frame projects. Later on, field results showed how the transformational development at strategic level was underestimated. Kimbell (2011) claims that service designers see services as relational and temporal and thought of value as created in practice, however, designers lack of knowledge of management (Borja de Mozota, 2006). Boland et al. (2007) suggests leaders frame managing as designing and considering metadesign as an attitude, and for smaller companies led by the owner as managing director, can contribute equally directly to the design process. Besides the size of the firm, prior studies have reported a strong relationship between managing and designing (Boland et al., 2007), recognising the role of product development as means for organisational change (Junginger, 2007). In fact, Junginger (2015) encourages service designers to take into consideration the existing design practices and legacies within an organisation with the ultimate goal of achieving transformational thinking instead of embedding design. However, the idea of embedding design thinking and design capabilities as a learning process for innovation (Ward and Dekker, 2009) and service design (Bailey, 2012) has to originate from the awareness of the existing practices already in place. Relating this notion to the current research means that design has the potential to be used as a vehicle for organisational change to achieve servitization. Previous studies demonstrate that NPD is a catalyst for organisational change (Takeuchi and Nonaka, 1986; Junginger, 2007; Ates and Bititci,
2011) and Shostack (1987) points out that positioning service requires structural change; since services are semantic transformations where the customer experience is the result of the brand and NSD alignment (Clatworthy, 2012). Moreover, the understanding of design in organisations is goods-centric, as design legacies in terms of principles, methods and practices, and they need to be overcome (Junginger, 2015). And servitization results in different types of PSS (Tukker, 2004) with different degrees of service. Unlike large organisations, smaller firms tend to rely on the logic of effectuation to develop solutions that result from the limited resources available and flexibility because of a commitment to a small number of projects only, as opposed to the managerial logic of causation (Berends et al., 2014). Smaller companies have distinguishing characteristics: they are often organised as project-based firms, which means they are led by projects and they configure themselves to accomplish the next solution to develop. This prospective fits with the observations of Companies B and C: the managing directors frequently become involved in the technical and operational aspects to find a solution. The small companies of this study are managed by the entrepreneur that has founded the firm. This assessment tool produces a visual overview of the company. The deployment of the framework is intended to facilitate strategy planning of the functions and to make informed-decisions about servitization. In the last meeting all interviewees at board level confirmed they recognised themselves in the radar diagram where the answers they gave were represented.

6.5.1 LEARNINGS FROM PHASE 1 - EXPLORING

Preliminary information about the interviewees set out the scene. The choice of examining established firms helped to track the evolution of the business and the people working for it. In fact, their background
and the relationship between their qualification and the current role explained some of the decisions taken over the years and motivations to move ahead. The fact that service design tools are used as operative tools at the very front end and not designing a new service disclosed new opportunities for the service design discipline when engaging with companies. And on the other hand, as Company A said ‘Manufacturing is not just making one thing in one place’. However, this phase raised some contradictions such as the contrast between maintaining their identity of manufacturing companies and at the same time offering services that increase product purchases. The misconception of design for better functionality of products and customer service as a call centre type of support is a motivation to further illuminate the design role in servitization. Company A considers service design too loose and some of the tools too academic (e.g. personas) and needs numerous iterations before it can be applied.

6.5.2 LEARNINGS FROM PHASE 2 – DEEPENING UNDERSTANDING

In this key phase, preliminary data were confirmed by the interviewees and further details were added. At this stage, the answers from the deployment of the development process generates new questions on the value of servitization as a chance to redesign manufacturing companies. If a company positions itself in each of the dimensions, it is likely to recognise what kind of decisions to make that are related to PSS development.

6.5.3 LEARNINGS FROM PHASE 3 – ANALYSIS AND OUTCOME

Based on the presentation of the results to companies and their feedback, the readiness framework was well received in terms of
accuracy of the dimensions to describe how firms work under the servitization lens. However, the three companies expect profitability to be included in the framework, perhaps as a tenth dimension as company B suggested. Company A showed interest in implementing part of the recommendations in the report and the need for proving the economic benefits of servitization. In general Company A demonstrates the complementarity of the role of strategic decisions of the Marketing Director (e.g. being part of the directors meetings, board level meetings and being involved in activities such as selecting and reviewing ideas through the product proposal form) and the Operations Director decisions that are tactical and based on action and reaction (e.g. due to context pressure of time constraints and customers’ frustrations). Company B showed a close relationship between the Technological Director and the employees in the workshop (e.g. the MD role in the lab and the prototypes). In this company, the Managing Director plays the dual role making strategic and neo-strategic decisions; and as Technical Director tactical and operational decisions; while shop-floor staff make operational decisions only. In Company C, the MD leads the company and focuses on the variability of human behaviour of his employees. He is making strategic choices while the shop-floor staff seem to be involved in operational choices only.

6.6 IMPLICATIONS FOR THE READINESS FRAMEWORK

The rationale behind the creation of the readiness framework as assessment tool is to empower smaller companies to gain more control over their business starting from assessing their identity, culture and skillset. Recognising readiness is raising awareness of the organisational transformation and the behavioural change that servitization demands for, internal competences alignment of strategy and operations, offering repositioning and affirming a firm’s position.
in the supply chain. The range of product-service configurations that servitization offers spans from service as add-ons to advanced services; however, companies that wish to develop PSS require the adoption of service-oriented approach to frame a firm’s functions. In this thesis, service design has been used as meta-competence to frame business structure to prepare them to build new integrated offerings.

Smaller firms can utilise mapping tools to enhance the proximity to customers to envision their offering and to control suppliers and other stakeholders. Service design tools have the dual purpose of mapping out the current situations to envision future value propositions. With his operative paradigm for the industrialisation of services (Morelli, 2009a) suggests designers define tools to engage with companies. This thesis attempts to answer his question on the recipients of the communication of the design work, the content of the communication and the level of definition in the representation (e.g. brochure, readiness framework and report). Implications of the external engagement in repositioning the firm in the supply-chain emerge and questions on making or buying capabilities arise. All firms are evolving social structures with built-in characteristics and context-dependant features. In this thesis, the role of the researcher is to raise awareness on service as leverage for growth. Iterations over time of the readiness framework act as a transformative process that start from effectiveness and finalise awareness in a continuous learning process. This approach tends to be similar to the spiral model presented in service engineering Pezzotta et al. (2012). If servitization is not a linear process but it occurs in stages (Oliva and Kallenberg, 2003), firms have to start assessing their readiness to shift from a transactional to a relational form of customer interaction. To overcome barriers, the readiness framework suggests raising awareness on what to expect and what to change in line with the company vision. For smaller manufacturers to pursue servitization
and assess their readiness requires that firm’s refocus on: where to start (recognising their current servitization state); what they currently are and have (identity and skillset, reducing risk propensity therefore knowing what to expect); and, where they can and want to go (raising awareness on the dimensions to extend).
The exploratory approach of this thesis is based on drivers and barriers of servitization described in the literature and data collected that informed the readiness framework. The research questions have been answered with the aim of helping firms to understand the nature of change needed for service implementation. The overall aim of this research led to the creation of the framework that assesses servitization readiness. The deployment of this tool allows companies to assess across nine dimensions to better understand their readiness for a service design approach to PSS development. Further, the framework can be considered as an initial step in understanding how this tool enables firms to raise awareness on the transition from product to PSS. Findings from the deployment of the readiness framework confirm that servitization is more than adding services to products; it is a cultural, organisational, relational and transformational phenomenon that requires readiness for change. The framework was useful in the identification of the relevant factors of servitization of manufacturing firms. It takes into account heterogeneity as an adaptive tool so that each company can see itself in the radar diagram and frame the steps to implement services.

Research question 1 has been answered in *Chapter 4 - Developing the readiness framework* with the identification of the factors for enabling the development of services in smaller manufacturing companies. Research question 2 has been answered in *Chapter 5 - Testing the framework*. The nine dimensions that look at organisational and cultural aspects that initially emerged from the literature and the interviews, informed the readiness framework that has been tested to relate to the company experience and capability as a whole. The tool has also been assessed against other tools, demonstrating usefulness through the presentation of the company at
a point in time, helping the company to make decisions on what to do to prepare for increased servitisation.

Finally, research question 3 shows that confidence and effectiveness of companies towards the deployment of the readiness framework, led them to reflect on the configuration of it as an assessment tool for companies.

Results of the deployment of the readiness framework show that Companies A, B and C are at different stages in the servitization journey. Their path and offerings confirm that there is no predefined transition process in smaller firms (Kowalkowski et al., 2013). The different value constellations take many forms as the heterogeneity of service offerings and business networks that occur. Willingness and readiness to undertake servitization have to be considered in relation to the existing design practices and how decisions are taken within the firm. This thesis aims to contribute at the servitization discourse on service design and organisational change initially explored by Junginger and Sangiorgi (2009). The results show where each firm sits in the servitization journey and recommendations have been developed for each of the participating companies based on the answers of the respondents at strategic and operational levels; those suggestions are intended to extend the dimensions further. Meetings took place over the course of one year. Once the data collection phase was completed, the results and recommendations (see Appendix E – Reports) of the deployment of the readiness framework tailored for each of the companies were presented to the firms. Final feedback at board level of the three participating companies provided valuable information on improvements and further research to undertake (Chapter 7 – Section 7.3 - Future research). The richness of qualitative research is in discovering multiple nuances of a topic. Each of the companies contributed with its experience, successes, drivers and challenges in considering services as competitive advantage.
7.1 CONTRIBUTION

This research has practical applications. It points to manufacturers to raise awareness that undertaking servitization is not just adding services to existing offerings, but that it affects the way the organisation is structured to serve customers. The readiness framework is a tool developed to empower firms to frame and recognise their readiness to develop PSS. With the readiness framework, manufacturing firms have the opportunity to assess their business to extend their service design knowledge and improve their customer-oriented awareness. The challenge behind the framework is to empower non-service designers to implement ideas, starting from a formalisation of the interactions (channels and touchpoints) between manufacturers, customers and stakeholders, where services are seen as an enabler or better as the glue (Lipparini and Sobrero, 1994) between products and experiences that allows transformation.

The readiness framework helps small companies to frame and reconsider their values and activities in light of servitization. Results from the application of the framework show the strategic nature of the tool, and although it was less effective on an operational level, the size of the firms makes it possible to frame the new tasks to impact everyday life at a shop-floor level also. In this way, firms have the opportunity to assess their business to recognise critical factors in service implementation. The readiness framework is built upon what the firm is today and its willingness to PSS development. Extending service design knowledge raises awareness on the firms’ customer-orientation in terms of servitization on limited customer-facing employees that find hard to see the value in services (e.g. task-based engineers that focus on technical details).
7.2 LIMITATIONS

The framework was informed by the themes found in the literature and the results of the first phase (exploring) of the research with the three selected firms. The subsequent phases, namely deepening understanding and analysis and outcomes, consisted in the deployment and testing of the assessment tool with the same companies involved in the previous phase. This could have affected the results in the way the assessment tool has been created according to the information given by the respondents in the semi-structured interviews.

This research showed how servitization is framed from each of the three manufacturing companies selected. Company A and B were previously involved in the Service Design Programme and with Company C demonstrated some interest in growth through the development of services, service design and user-centered design. The three firms were perceived as stable and having established design process procedures. They were all geographically accessible, willing to participate to this research and entertain regular visits over a one year period. Despite the interest of investigating servitization within smaller firms (this is why Company B and C were selected), the small sample size did not allow collecting comparative data of firms in the same sector or the same size with respect to the selection criteria indicated in the methodology (Chapter 3, Section 3.2.3 Design Cases’ selection strategies). Because of the novelty of the topic and the lack of small companies, Company A was included in the exploration of the role of service design in the servitization journey although it was bigger in size than B and C. Although Company A is bigger and more complex in structure, it was chosen because it has entrepreneurial family-owned business characteristics, with a culture very focused on cash, income generation, and led by short-term priorities - therefore presenting similar characteristics to
smaller organisations. This suggests that, within the sample, servitization does not look different across sizes. Value constellation is based on company path, structure and resources. Engaging with companies is a time-demanding task but building relationships with the three manufacturing firms of this thesis has been an enriching experience. Data were collected through in-person meetings and in-depth interviews, engaging with people in their workplaces, getting to know motivations and ambitions of Managing Directors and employees working in the workshop, listening to their personal stories and experiences. Open-ended questions at the outset of the research and the ones of the readiness framework were valuable means to explore motivations and expectations of firms towards servitization. However, there is clearly still much work to be done to understand what benefits service design can bring to manufacturing firms in the servitization journey.

A limited generalisability of results stems from the three design cases. The small sample and the creation of design cases offer an overview of distinctive characteristics of the three manufacturing companies. However, future research may involve a broader range of companies to overcome these limitations. Servitization can take different forms and companies are at different stages in the servitization journey. They present different culture, history, structure and resources to assess the potential of PSS. To conclude, although this thesis has been developed following a rigorous method, there may be bias and assumptions of the researcher to overcome.

7.3 FUTURE RESEARCH

This research will serve as a base for future studies on service design research in manufacturing. Despite the exploratory nature, this study offers some insight into the exploration of the role of service design in servitization. In the future, it will be useful to develop more case
studies involving a broader range of companies, for instance, involving a bigger body (e.g. Institute of Manufacture) to test a streamlined version of the readiness framework. Although quantitative considerations were beyond the scope of this study, the involvement of a larger sample of companies will justify the use of mixed methods and offer a more complete picture of the servitization phenomenon.

Service design, in line with other disciplines involved in servitization, has to continue integrating its perspective in the service research community to describe the facets and implications of the integration of services in manufacturing. New collaborative research projects are needed to bridge design and management within the engineering context (what practitioners call the ‘real world’ of manufacturing companies). The integration and dialogue among disciplines have to start considering behavioural and social interaction aspects to design better value propositions.

The scope of this research was to offer smaller manufacturing companies a tool to recognise their readiness to start the servitization journey. This topic raises many new unexplored facets that need to be investigated. Further research that should be undertaken includes the investigation of a shared definition of service for practitioners.

The deployment of the readiness framework can be adopted as an internal diagnostic or evaluative tool for a company to track its performance over time through iterations of the framework (recognise when and where changes happen; organic growth and hiring processes within the size of the firm).

Alternative versions of the readiness framework can be deployed to single projects where each dimension can be seen as a function/task or role within the organisation. A subset version of the framework can be developed for operational level. The readiness framework can be adapted to assess employees’ individual performance too.
Extensions of the readiness framework can be developed for assessing market readiness (e.g. mature markets, which indicators are relevant? Is servitization a market company-led or market push phenomenon? Is innovation a matter of affordability or readiness? How is a firm positioned in the market?). Or for assessing customer readiness (e.g. service history: customer-driven or firm-driven?).

The introduction of profitability as a tenth dimension in the readiness framework can advance the discourse on the financial implications of servitization. It would be useful to explore how affordability – profitability and risk propensity are linked to each other in servitization. Understanding the factors that reduce risk perception in servitization may encourage more companies to approach PSS. The investigation of a broader sample of firms across an industry may shed light on the discovery of new emerging patterns among the dimensions (e.g. family-owned businesses; similarities and differences of organisations in other industries; differences from large organisations). This thesis represents a way to frame servitization to see potential in service as source of value with the aim of bridging theory and practice and with the hope of continuing to advance the readiness framework with and for other companies.

7.3.1 TOWARDS THE READINESS FRAMEWORK 2.0

In light of the iterative process adopted thought out this study and the reflective practice as researcher in design, the evaluation against other tools in the literature shows how the readiness framework can be further improved according to the following: more detailed description of each dimension and creation of sub-dimensions for better operationalised decisions (from dimensions to recommendations to tasks). Since the readiness framework was developed as initial exploration of servitization within smaller firms, further development of the dimensions and the creation of subsets of
them may lead to a more comprehensive understanding of this phenomenon and its implications. For instance, if the service history dimension shows the options of PSS, other issues emerge such as bundling and unbundling the offering and the transfer of ownership; tracking when and where services start to become important within the firm. In the external engagement customers, suppliers, and competitors have a role too and their readiness is not included in this framework; there is an opportunity to include them as elements of the supply-chain and their relationships with large organisations. The experience dimension can explore alternative skills needed, elements of NPD to keep and NSD to build in terms of unlearning previous products design practices and learning new co-creation practices leveraging on the dynamic and distinctive capabilities of the firm. The risk propensity dimension can be related to a specific project or the overall business. Moreover communication can be framed as internal and external, meaning that the evaluation of the brand reputation that comes from past effective products. To conclude awareness should be represented as a long-term vision and goals to achieve and steps to take. Moreover, the addition of profitability as the 10th dimension to give an indication of the economic reward drawn from the origins of revenues between product, service or integrated/bundled offering (this was suggested by Company B). This may enhance the quantification of the transition costs applied to smaller companies to better frame the nature of the structural change required. Although Grönroos and Ojasalo (2004) introduced a service productivity model to measure the economic results of services, it assumes it is deployed in open systems (such as the service industry) where customers participate in co-creating and delivering phases. Considering the service history and the external engagement, Davies et al. (2006) suggest three levels of maturity such as: different types of learning processes; capability-building activities; and changes in organisational design. Therefore, iterations of this tool are expected
to adjust the measurement needed to understand if integrated solutions are sustainable to scale and repeat.

### 7.3.2 IMPLICATIONS FOR DESIGNERS

The readiness framework has been developed as a means to engage with companies to discuss servitization. Designers can use this tool to evaluate how to engage and offer coaching and training to smaller companies and SMEs. The readiness framework as a diagnostic tool enables other designers to define previous practices and future design interventions. In this thesis design for strategy shows that the creative process heavily relates to planning and managing social and organisational components within the firm.

### 7.3.3 IMPLICATIONS FOR POLICY MANAGERS

Policy managers have to bridge the gap between design and service, promoting design-oriented approaches for service-led implementation strategies building on small manufacturing established firms.

Although design is widely recognised at the governmental level as an innovative tool for companies to stay competitive, the impact of service design in smaller manufacturing companies is an under-researched topic. This size and type of company lacks the economic and infrastructural support to develop services this further. Findings show that taking a strategic approach to service design results in positive outcomes. Policy managers now have a tool to plan interventions to support manufacturers in the servitization journey. In promoting PSS, policy manager have the opportunity to frame smaller companies’ competences and to sense the potential in service creation. The readiness framework is therefore a tool to help plan and support companies undertake the journey to servitization.
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APPENDIX A – INFORMATION SHEET

14 November 2016

PARTICIPANT INFORMATION SHEET

Title of Project: The creation of a service design development process for manufacturing SMEs

Background

This exploratory project aims at understanding how the introduction of the ‘service’ concept (its notion, similarities and differences from product) affects the current ideation, creation and development process within manufacturing SMEs. In brief, this research project is concerned with the advantages and disadvantages of service design tools while coming up with new ideas on a product-service system.

There are two areas that the project will examine:

- The understanding/integration of a ‘service’ concept for manufacturing SMEs;
- The potential role of service design tools in developing a product-service system.

Your participation in the research project

Your company has been invited to take part in this research project because we recognise that your experience will be helpful to us in better understanding if there is a potential for Service Design tools in developing service innovation for manufacturing companies. Further, it may be possible to co-develop interventions that might be of benefit to your company as a result of this research.

What would happen if you agree for your company to join this research project?

If you agree for your company to join this research project, there are three main things that will happen:

1. The researcher will visit your company and will interview the owner/manager and the employees involved in the development process from ideation to production.

2. The researcher will attend the project team meetings and will lead workshop sessions starting from the introduction of the service design approach and the integration of the service design tools then.

3. At the end, after the analysis of the interviews transcription and the workshop session, the service design development process will be created and you will be offered the opportunity to evaluate the overall experience.

Are there any risks?

There are no significant risks to your company. This study is on a voluntary basis and you can withdraw at any time. Anonymity and confidentiality are ensured, that is, we will not publish anything that can identify your company without your permission. We will offer you the opportunity to review any documents we produce prior to publication to ensure that no commercially sensitive information is released.


Appendix A – Information sheet  211
What happens to the results of the research study?

The analysis of the interviews transcription and the workshop sessions will provide significant information and insights to inform the creation of a service design development process.

Research papers will be written for academic publication purposes (PhD Thesis, conference papers, journal articles, etc.) However, please see the section above regarding the anonymisation of such research data.

Are there any benefits from taking part?

You will receive training on design thinking processes, the service design approach and the transition from a product-oriented to becoming a service-oriented company.

Further information

If you have any questions about the research or how I intend to conduct the study, please contact me.

Researcher  Giulia Teso
Tel  +44 (0) 29 2020 5538
Email  gteso@cardiffmet.ac.uk
Address  International Centre for Design and Research PDR
Cardiff Metropolitan University
200 Western Avenue
Cardiff
CF5 2YB
United Kingdom
APPENDIX B - CONSENT/ETHIC FORM

PARTICIPANT CONSENT FORM

Title of Project: The creation of a service design development process for manufacturing SMEs

Company name:
Participant name:

Please initial each box.

1. I confirm that I have read and understand the information sheet above. I have had the opportunity to consider the information, ask questions and have had these answers satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.

3. I agree to take part in the above study.

4. I agree to the interview / workshops’ participation / consultation being audio and video recorded.

Signature of Participant ___________________________ Date ____________

Name of person taking consent ___________________________ Date ____________

Signature of person taking consent ___________________________

*When completed, 1 copy for participant & 1 copy for researcher site file

PDR

14 November 2016
APPENDIX C - FIRST QUESTIONNAIRE AND LEAFLET

Template semi-structured interview for companies

*Thank you for taking time from your busy schedule to meet with me; as introduced in the email, my PhD research focuses on understanding if there is a potential for Service Design tools in developing service innovation for manufacturing companies.*

Preliminary questions

Date of the interview

Place

Time

First name

Surname

Role/Position in the company

Respondent’s background

Emphasis/specialty

Time script: 1 hour interview (preliminary research online and offline)

Documents: information sheet and consent/ethic form
I would like to start with generic information about your company.

- Could you introduce your company, please?

- What is your ambition for your company for the next 6-12 months? Which are the priorities of the firm?

- How do you strive for competitive advantage? (How do you achieve this? Could you provide some examples of innovation: in the process, product etc.)

- Who are your customers?

- What need are you fulfilling for your customers? Could you describe how?

- Who are your main competitors? What do they offer?

In the coming section I will focus my questions on routine activities.

- Being the managing director of your company, what activities are you involved in?

Let’s talk about design & business strategy now

- Can you describe how Design is used within your business? (e.g. plant layout, branding, signage)

- Is design or New Product Development ever discussed at Board-level meetings or is it included in your business planning processes? And what aspects of design are discussed?

We are now ready to talk in depth of the design process

- Are there any in-house designers? What do they do? (e.g. skills, tools they use: freehand drawing, CAD, prototyping)

- Who is usually leading the development process in your company and involved in the design development decisions?

- Who else is involved? (Can you describe who and their roles...)
• How often do you launch a product/service into the market? (How long does it take from the initial idea to the launch into the market?)

• How does a new development project originate? (Where does the team take inspiration from? E.g. client-led...) and how do you select and validate your idea?

• The discussions we’ve just had could describe a formalised development process; are you satisfied with the formalisation of your processes, or do you have ambitions to improve the formalisation of your processes?

Service perception

I’ve come to talk to you because I recognise that you are a product producing company; however, my research is based upon anticipated changes in the market that mean that consumers are increasingly interested in the experience of interaction which might be delivered through a combination of products and services.

So, I would like to explore with you what Service might mean to your business, i.e. what opportunities you think there might be in service development either by yourself or with interested third parties.

• Can you describe what Service Design means to your company?

• After the project with the PDR’s service design team, how has your offering evolved?

• How are services designed in your company? (E.g. do you design them as a bundle of product and service elements or separately? Who is involved in this process?)
Leaflet

This is a leaflet that summarizes my research. It’s intended to support the discussion on drivers and barriers of manufacturing SMEs when implementing services.

I chose these values: technology, organization and culture that are implied in service design activities (technological knowledge, social aspect of technology and the organizational aspects in terms of attitude and capability). I took them from an academic article by Nicola Morelli on the methodology behind the design of PSS.

So, I’d like to spend 15-20 minutes exploring with you which are the main barriers you faced when you started designing services in a more structured way.
Appendix C - First questionnaire and leaflet

The author

Giulia Tessa is a PhD researcher at PDR. Prior to arriving in the UK, she studied Industrial Design within the School of Design at Politecnico di Milano, specialising in Service Design. This experience was consolidated with an internship at the National Health Care Service in Tinos (Greece) that formed the basis of her Master's Thesis. In 2014, she was awarded with a Research Innovation Award (RiSA) from Cardiff Metropolitan University. Her research interests involve helping manufacturing SMEs access Service Design and benefit from a formalised Service Design Process.

This leaflet is intended to support the interviews and trigger a discussion about drivers and barriers within manufacturing SMEs in the process of embracing services to their existing product offering. Inside you will find a diagram to fill out with.Pick it notes on the perceived barriers of the servitisation process.

POD: an international centre for design & research

POD is a world leading design consultancy and applied research centre. We have a unique approach, training leading, high quality research activity alongside award winning, proven and highly experienced consultancy practice. For over two decades this perspective and the robust knowledge and capabilities we have built on the research side of our business to deliver world-leading results and outcomes for the companies and organisations we work with.

Located within Cardiff Metropolitan University we are organised across eight groups, each a leading expert in its field with an extensive history and greater catalogue of projects, innovations and ground-breaking knowledge. Each group is a globally renowned source of expertise and practice in its field. Together, under one roof, we use our research knowledge and expertise to understand and innovate. POD at the cutting edge of knowledge and practice and a world-leading centre in design and innovation.

Service Design

Service Design leverages mapping tools that enable companies to visualize ideas and translate them into practice with the ultimate goal of conceiving and delivering services that support people to accomplish tasks in given contexts and co-creating value inside and outside the firm.

Customers are demanding better experiences from the products they buy, and this often comes from the services linked to physical products. Therefore, there is an increasing need for manufacturers to consider service design in order to remain competitive.

As you can see in the following page, the diagram shows that management and marketing are two disciplines that mostly influence the service design process. While the first focuses on the organisational aspects (including the internal motivations and incentives), the second focuses on a communication plan to promote the offering. Additionally, behavioural aspects are relevant in this transition.

Since service design is an advocate of the user-centred design (UCD) approach, it aims to enable firms to develop skills such as mapping, visualising and anticipating customer needs in order to create pleasant and consistent experiences for their customers. Finally, an increased control over the user journey will be beneficial for companies to also consider the needed back-office changes to achieve it.
Figure C-0-3 Leaflet - inside
### APPENDIX D - READINESS FRAMEWORK

Below is the set of questions based upon the framework that companies answer to generate a readiness profile.

#### #1 EFFECTIVENESS

<table>
<thead>
<tr>
<th>Thinking of customer feedback: how do your customer consider...</th>
<th>Very poor/ Poor/ Fair/ Good/ Very good</th>
</tr>
</thead>
<tbody>
<tr>
<td>- responsiveness (e.g. quotes)</td>
<td></td>
</tr>
<tr>
<td>- superiority of the solution</td>
<td></td>
</tr>
<tr>
<td>- production process (e.g. accreditation, certification)</td>
<td></td>
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<tr>
<td>- price</td>
<td></td>
</tr>
<tr>
<td>- pre-sale assistance</td>
<td></td>
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<tr>
<td>- post-sale assistance</td>
<td></td>
</tr>
<tr>
<td>- interaction with customers</td>
<td></td>
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<tr>
<td>- interaction with employees</td>
<td></td>
</tr>
<tr>
<td>- interaction with supplier</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How often is a successful product translated into?</th>
<th>Never/ Occasionally/ Sometimes/ Often/ Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>- repeated purchase</td>
<td></td>
</tr>
<tr>
<td>- new upgraded projects (bigger/challenging/more responsibilities) from the same customer</td>
<td></td>
</tr>
<tr>
<td>- new customers (word of mouth)</td>
<td></td>
</tr>
<tr>
<td>- other</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How often is each of the following, the primary reason for success?</th>
<th>Never/ Occasionally/ Sometimes/ Often/ Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>- good design</td>
<td></td>
</tr>
<tr>
<td>- teamwork</td>
<td></td>
</tr>
<tr>
<td>- commitment</td>
<td></td>
</tr>
<tr>
<td>- environment</td>
<td></td>
</tr>
<tr>
<td>- market</td>
<td></td>
</tr>
<tr>
<td>- other</td>
<td></td>
</tr>
</tbody>
</table>
#2 EXPERIENCE

<table>
<thead>
<tr>
<th>How often did you consider the level of cross-fertilization with...</th>
<th>Very poor/ Poor/ Fair/ Good/ Very good</th>
</tr>
</thead>
<tbody>
<tr>
<td>- other companies in the same field (supply chain relationships)</td>
<td></td>
</tr>
<tr>
<td>- other companies in closer fields (non-supply chain relationships)</td>
<td></td>
</tr>
<tr>
<td>- companies in completely different fields</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Where do lessons learnt come from?</th>
<th>Never/ Occasionally/ Sometimes/ Often/ Always</th>
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</thead>
<tbody>
<tr>
<td>- successes</td>
<td></td>
</tr>
<tr>
<td>- failures</td>
<td></td>
</tr>
<tr>
<td>- other</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How often has one of the following led to changes in your role?</th>
<th>Never/ Occasionally/ Sometimes/ Often/ Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>- market drivers</td>
<td></td>
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<tr>
<td>- technological drivers</td>
<td></td>
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<tr>
<td>- personal motivation</td>
<td></td>
</tr>
<tr>
<td>- customer demands</td>
<td></td>
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<tr>
<td>- other</td>
<td></td>
</tr>
</tbody>
</table>
#3 SERVICE HISTORY

<table>
<thead>
<tr>
<th>How would you define your offering in terms of...</th>
<th>Very poor/ Poor/ Fair/ Good/ Very good</th>
</tr>
</thead>
<tbody>
<tr>
<td>- breadth - diversification</td>
<td></td>
</tr>
<tr>
<td>- depth - sophistication (modularity, level of complexity, one-off project or potential to be standardized)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>When developing product-service system solutions where do you position your firm?</th>
<th>Not in use/ Start planning/ Planned/ Start implementing/ Implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>- transaction cost per unit</td>
<td></td>
</tr>
<tr>
<td>- product-related service</td>
<td></td>
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<tr>
<td>- advice and consultancy</td>
<td></td>
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<tr>
<td>- product lease</td>
<td></td>
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<tr>
<td>- product renting or sharing</td>
<td></td>
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<tr>
<td>- activity management</td>
<td></td>
</tr>
<tr>
<td>- pay per unit use</td>
<td></td>
</tr>
<tr>
<td>- functional result</td>
<td></td>
</tr>
<tr>
<td>- other</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aside from physical products, what do you explicitly charge for?</th>
<th>Never/ Occasionally/ Sometimes/ Often/ Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>- preparing a quotation</td>
<td></td>
</tr>
<tr>
<td>- training customers</td>
<td></td>
</tr>
<tr>
<td>- training third parties</td>
<td></td>
</tr>
<tr>
<td>- updating/upgrading</td>
<td></td>
</tr>
<tr>
<td>- delivery</td>
<td></td>
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<tr>
<td>- maintenance</td>
<td></td>
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<tr>
<td>- other</td>
<td></td>
</tr>
</tbody>
</table>
#4 EXTERNAL ENGAGEMENT

<table>
<thead>
<tr>
<th>How well do you consider the level of cross-fertilization with...</th>
<th>Very poor/ Poor/ Fair/ Good/ Very good</th>
</tr>
</thead>
<tbody>
<tr>
<td>- other companies in the same field (supply chain relationships)</td>
<td></td>
</tr>
<tr>
<td>- other companies in closer fields (non-supply chain relationships)</td>
<td></td>
</tr>
<tr>
<td>- companies in completely different fields</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To what extent do the followings influence the way you ideate/develop/deliver a solution?</th>
<th>Very poor/ Poor/ Fair/ Good/ Very good</th>
</tr>
</thead>
<tbody>
<tr>
<td>- other companies in the same field (supply chain relationships)</td>
<td></td>
</tr>
<tr>
<td>- other companies in closer fields (non-supply chain relationships)</td>
<td></td>
</tr>
<tr>
<td>- companies in completely different fields</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How often do you discuss new solutions with:</th>
<th>Never/ Occasionally/ Sometimes/ Often/ Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>- suppliers</td>
<td></td>
</tr>
<tr>
<td>- customers</td>
<td></td>
</tr>
<tr>
<td>- competitors</td>
<td></td>
</tr>
<tr>
<td>- other</td>
<td></td>
</tr>
</tbody>
</table>
### #5 CULTURE AND DEVELOPMENT

<table>
<thead>
<tr>
<th>Do you undertake any of the following activities to promote continuous learning?</th>
<th>Not in use/ Start planning/ Planned/ Start implementing/ Implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>- employees suggestion system</td>
<td></td>
</tr>
<tr>
<td>- incentives system</td>
<td></td>
</tr>
<tr>
<td>- reward system</td>
<td></td>
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<tr>
<td>- individual performance review</td>
<td></td>
</tr>
<tr>
<td>- other</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How often are employees from other different functions involved in the following?</th>
<th>Never/ Occasionally/ Sometimes/ Often/ Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>- ideation phase</td>
<td></td>
</tr>
<tr>
<td>- development phase</td>
<td></td>
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<tr>
<td>- prototyping phase</td>
<td></td>
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<tr>
<td>- delivery phase</td>
<td></td>
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<tr>
<td>- other</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>How often do you promote continuous learning to your employees?</th>
<th>Never/ Occasionally/ Sometimes/ Often/ Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>- training</td>
<td></td>
</tr>
<tr>
<td>- attendance to conference</td>
<td></td>
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<tr>
<td>- attendance to trade exhibitions</td>
<td></td>
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<tr>
<td>- attendance to forum</td>
<td></td>
</tr>
<tr>
<td>- other</td>
<td></td>
</tr>
</tbody>
</table>
**#6 CREATIVITY**

<table>
<thead>
<tr>
<th>How would you describe the following characteristics of the working environment your employees are immersed in?</th>
<th>Very poor/ Poor/ Fair/ Good/ Very good</th>
</tr>
</thead>
<tbody>
<tr>
<td>- working space conditions</td>
<td></td>
</tr>
<tr>
<td>- collaboration among different functions</td>
<td></td>
</tr>
<tr>
<td>- promote independent exploration of new ideas</td>
<td></td>
</tr>
<tr>
<td>- promote testing of new ideas</td>
<td></td>
</tr>
<tr>
<td>- other</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>How often do your employees discuss with management about the following?</th>
<th>Never/ Occasionally/ Sometimes/ Often/ Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>- improvements on existing products</td>
<td></td>
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<tr>
<td>- improvements in the production process</td>
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<tr>
<td>- improvements in promoting a solution</td>
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<tr>
<td>- introduction of new solution(s)</td>
<td></td>
</tr>
<tr>
<td>- other</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How often do you offer your employees the followings to explore new independent ideas?</th>
<th>Never/ Occasionally/ Sometimes/ Often/ Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>- time</td>
<td></td>
</tr>
<tr>
<td>- resources</td>
<td></td>
</tr>
<tr>
<td>- spaces</td>
<td></td>
</tr>
<tr>
<td>- tools</td>
<td></td>
</tr>
<tr>
<td>- other</td>
<td></td>
</tr>
</tbody>
</table>
#7 RISK PROPENSITY

<table>
<thead>
<tr>
<th>What is the level of acceptance among the employees of the followings?</th>
<th>Very poor/ Poor/ Fair/ Good/ Very good</th>
</tr>
</thead>
<tbody>
<tr>
<td>- new project</td>
<td></td>
</tr>
<tr>
<td>- new development process</td>
<td></td>
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<tr>
<td>- new production process</td>
<td></td>
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<tr>
<td>- new tools</td>
<td></td>
</tr>
<tr>
<td>- new machinery</td>
<td></td>
</tr>
<tr>
<td>- new team</td>
<td></td>
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<tr>
<td>- other</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How do the different departments react to change (rejection, resistance, passive acceptance, facilitation, active acceptance)?</th>
<th>Very poor/ Poor/ Fair/ Good/ Very good</th>
</tr>
</thead>
<tbody>
<tr>
<td>- engineering department</td>
<td></td>
</tr>
<tr>
<td>- marketing department</td>
<td></td>
</tr>
<tr>
<td>- sales</td>
<td></td>
</tr>
<tr>
<td>- account management</td>
<td></td>
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<tr>
<td>- workshop</td>
<td></td>
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<tr>
<td>- other</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How often is the following a barrier to develop a solution?</th>
<th>Never/ Occasionally/ Sometimes/ Often/ Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>- poor internal communication</td>
<td></td>
</tr>
<tr>
<td>- lack of competencies</td>
<td></td>
</tr>
<tr>
<td>- lack of knowledge in regulations etc.</td>
<td></td>
</tr>
<tr>
<td>- other</td>
<td></td>
</tr>
</tbody>
</table>
#8 COMMUNICATION

<table>
<thead>
<tr>
<th>In the ideation phase how often do you consider the following?</th>
<th>Never/ Occasionally/ Sometimes/ Often/ Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>- brand image/ awareness</td>
<td></td>
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<tr>
<td>- usability</td>
<td></td>
</tr>
<tr>
<td>- price</td>
<td></td>
</tr>
<tr>
<td>- value for money</td>
<td></td>
</tr>
<tr>
<td>- delivery</td>
<td></td>
</tr>
<tr>
<td>- installation</td>
<td></td>
</tr>
<tr>
<td>- maintenance</td>
<td></td>
</tr>
<tr>
<td>- other</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How well all the different department communicate with each other?</th>
<th>Never/ Occasionally/ Sometimes/ Often/ Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>- all with all</td>
<td></td>
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<tr>
<td>- some with all</td>
<td></td>
</tr>
<tr>
<td>- some with some</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How well is information exchanged within the firm?</th>
<th>Never/ Occasionally/ Sometimes/ Often/ Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>- all with all</td>
<td></td>
</tr>
<tr>
<td>- some with all</td>
<td></td>
</tr>
<tr>
<td>- some with some</td>
<td></td>
</tr>
</tbody>
</table>
#9 AWARENESS

<table>
<thead>
<tr>
<th>How often are customers involved in the following phases?</th>
<th>Never/ Occasionally/ Sometimes/ Often/ Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>- ideation</td>
<td></td>
</tr>
<tr>
<td>- development</td>
<td></td>
</tr>
<tr>
<td>- prototyping</td>
<td></td>
</tr>
<tr>
<td>- delivery</td>
<td></td>
</tr>
<tr>
<td>- follow-up</td>
<td></td>
</tr>
<tr>
<td>- other</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>How are the following considered within your company?</th>
<th>Very poor/ Poor/ Fair/ Good/ Very good</th>
</tr>
</thead>
<tbody>
<tr>
<td>- design thinking approach (e.g. brainstorming, customer journey)</td>
<td></td>
</tr>
<tr>
<td>- involvement of customers in the ideation phase</td>
<td></td>
</tr>
<tr>
<td>- prototypes</td>
<td></td>
</tr>
<tr>
<td>- services that support the relationship with the customer</td>
<td></td>
</tr>
<tr>
<td>- services that support product sales</td>
<td></td>
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<tr>
<td>- other</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What are you planning to improve next?</th>
<th>Not in use/ Start planning/ Planned/ Start implementing/ Implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>- engagement with customers</td>
<td></td>
</tr>
<tr>
<td>- engagement with stakeholders</td>
<td></td>
</tr>
<tr>
<td>- understanding needs of stakeholders</td>
<td></td>
</tr>
<tr>
<td>- other</td>
<td></td>
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</tbody>
</table>
APPENDIX E - REPORTS

The sections below are presented the recommendations for the three companies based on the analysis of the interviews.

RECOMMENDATIONS FOR COMPANY A

Based on the perception of Company A, the answers given show that your company is positioned quite high in the readiness framework that takes into account the conditions considered important for servitization.

Despite this, as confirmed during the interviews, Company A is a product-based company and senses limited economic benefits in framing services as a source of revenue for the company. In the radar diagram, service history and risk propensity are scored low. There is a wide range of products in Company A’s portfolio and in the selection and validation process of new products rapid economic reward is considered the main criterion.

Services are described as interactions with touchpoints that occur in time and space. They can be perceived as undefined by nature but this does not imply that cannot be designed and continuously refined with the goal of contributing to the company growth.

As in the interview with the operations director, he sees his department’s task as to see the frustrations of customers early in the process, keep listening and change the customer interaction accordingly. Many aspects regarding the creation of the value propositions are discussed at the front-end of the development process with different priority levels set from the pressure of the daily issues to be solved. From the interviews I perceived a potential lack of formalised communication routes joining the early customer interaction knowledge of the marketing department and the
customer-focused considerations at the beginning of the product development process.

**Recommendation:**

**Map how customer feedback gathered from the operations department is used to make informed decisions in the product development process.**

The integration/extension of the existing tool currently used at operations level to systematically track and measure performance (internally and externally) can be beneficial to further advance the service offering. The first hand information from reps, contractors and customers makes the operations department an invaluable source of information and a useful leverage for translating those insights for the engineering department and the workshop.

**Recommendation:**

**Map how the notion of service is shared and communicated within the company.**

The marketing and operations departments are identified as the change agents in this servitization journey because they play the role as interface with the engineering and workshop departments; and, as the recipients of the information framed and translated in product and/or service requirements. This process might also affect the product proposal form turning it into a more general innovation proposal form.

Following the previous involvement of the firm in training sessions with service designers, your firm benefitted from deploying the service design approach. It impacted the product development process and the decision-making process, improving the business focus in strategic terms.
Although the focus is on products, often innovation is a social process, and in this sense the notion of service promotes a relationship-based rationale where soft aspects and a user-centred approach are considered to integrate a quantitative approach that defines the value to be created. It became evident through the interviews that where a product had been developed to meet a single customer need, that solution was often found to be applicable to numerous other customers.
**RECOMMENDATIONS FOR COMPANY B**

Based on Company B’s perception, the answers given show that this company is mostly positioned in an advanced state of servitization in the readiness framework with dimensions scoring from 3 in the external engagement to 5 in effectiveness and communication. However, servitization implies a number of changes to manage this transition from product-based to service-based offering, and in order to achieve higher scores in all the dimensions, a list of recommendations is suggested below.

Once at a board level the commercial benefits of services were identified, they have started moving toward services, offering a remote control of the plants they sold with updates and upgrades overcoming the physical presence of the operator for ordinary maintenance or minor issues that occur. They started extending the relationship with their customers from one-off transactions to long-term contracts. For manufacturing firms looking to improve competitiveness, this kind of service logic represents a leverage for developing more customer-centric value propositions. And this impacts the configuration of the existing competences and the acquisition of new competences.

External engagement is a critical dimension when providing services because this development process involves a higher number of stakeholders to create the value proposition, to set up the conditions for keeping the “promise” to their customers. Therefore, defining the role and the influence of your firm within the actors’ network is essential to interact with suppliers, to involve lead customers in the co-creation process addressing their issues, and to identify the boundaries of their competitive strategy. During a meeting with their shop-floor employees, the idea of open innovation emerged as an example and a valuable option to compete in the market nowadays. In fact, often innovation is a social process, there is limited
formalized creative support tailored for small manufacturing companies since previous studies have focused on large organisations; the heterogeneity among small firms and their tacit development processes are not suitable for generalization. However, the service design readiness framework used at strategic level aims to bridge the operative side of the discipline and the current firm’s skillset offering a way to frame the company internally to understand how to deal with the “fuzzy front-end” to pinpoint a problem without precluding that an outcome might comprises of both products and service components.

**Recommendation:**

**Explore more opportunities for open collaboration, demonstrating your leading expertise in servitization in your field.**

On the operational side perspective, references and examples from previous working experiences made them appreciate the sense of pride and belonging of this company. And this is what motivates shop-floor employees to take into new challenges in the firm’s innovation journey. For this firm, advantages of working in a small company are the flexibility and the variety of the tasks to pursue quality but also to professionally grow. For board level staff to nurture a dialogue with the shop-floor employees that have their hands-in in project gives a snapshot of priorities and the perceived problems in the short-term.

During the interviews with your employees at shop-floor level, for one of them the concept of “service design development process” was not clear, so we started the discussion on what service means and implies in this context and then we continued throughout the other questions. This transition from product to service has an impact in the culture and development dimension, e.g. the attitude and the
values of the company to deal with customers or better “serve” them and having all employees bought in this approach.

**Recommendation:**

*Communicate and share the success of your service development in order to further advance your service culture*

Their answers show how effectiveness, experience and awareness are interdependent dimensions that are the foundations of the firm.

**Recommendation:**

*Further explanation of the notion of service needed internally in order to improve current awareness, and future effectiveness.*
RECOMMENDATIONS FOR COMPANY C

Based on the answers given, Company C has recently become interested in exploring services as a competitive strategy to future effectiveness. The diagram shows that the experience and awareness dimensions scored quite high in the readiness framework. In fact, one of their long-time client has asked you to start offering maintenance contracts to establish/formalize this relationship, that is resulting in an extension of the service history dimension. Their scores in the readiness framework represent an indication of the current state of servitization of this company.

Based on the perception of Company C, the answers resulted in creativity and risk propensity scoring low in the radar diagram. In the transition from product-based to service-based offerings, reconfiguration of the internal capabilities is needed to redefine how to address customers’ needs. In the literature, services -differently from products- have been defined as intangible, heterogeneous, inseparable and perishable. And manufacturing firms often find it hard to grasp this notion and to see value in developing services. However, the experiential aspects define the quality of interaction among people and products in context and over time.

Recommendation

Communicate and share the value of service in your firm: while products are usually defined with nouns, introduce the notion of services using verbs and actions. Give some examples of informal/implicit services that you are already providing to your customers and the benefit that brings to the firm.

In this context communication plays a key role in the flow of formal and informal information throughout the company and with customers and suppliers (from inside to outside and vice versa). And
at shop-floor level this dimension is perceived to be improved further too.

Recommendation

**Map how soft aspects contribute in the development process making an impact in the perceived happiness within the company and satisfaction of customers.**

Although the focus is on products, often innovation is a social process, and in this sense the notion of service promotes a relationship-based rationale. Early understanding of customer experience and customer values are likely to result in products and services that achieve greater customer satisfaction.

**Recommendation:**

**Develop customer engagement activities around visualisation and prototyping to deploy at the very front-end of the development process of product and service system (PSS).**

During the meetings the centrality of the individuals in the company has been largely discussed and the previous paragraphs show how most of the dimensions impacts the culture and the development of this firm and nurture the sense of belonging to the company. These aspects influence the way new competences are brought in the company and how employees feel motivated to work for and in your firm.