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**DEVELOPING ORGANIZATIONAL DYNAMIC CAPABILITIES
IN PROJECT-BASED INTEGRATED SOLUTION**

A study of Servitization in Chinese Water Treatment Industry

Master's Thesis in
Strategic Business Development

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LIST OF ABBREVIATIONS:

BOT	Building, Operation and Transfer
CEO	Chief Executive Officer
CRM	Customer Relationship Management
EPC	Engineering, Procurement and Construction
IO	Industrial Organization
KPIs	Key Performance Indicators
R&D	Research & Development
RBV	Resource-Based View
SCA	Sustainable Competitive Advantage
SECI	Socialization, Externalization, Combination, Internalization
SMEs	Small-to-Medium Enterprises
TMT	Top Management Team
VRIO	Valuable-Rare-Inimitable-Organizational
Wechat	One mobile Social Networking Application

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Abstract:

Manufacturing firms seeking to create and extend competitive advantage are striving to incorporate more services into their offerings. Although service is seen as service providers applying knowledge and skills for the benefits of customers, service providers are traditionally treated as pure decision takers, and their influence upon organizational dynamic capabilities is largely underestimated. There are research gaps such as how frontline service providers influence organizational dynamic capabilities and how organizational dynamic capabilities can be developed in servitization need to be systematically studied and explicitly explained.

This study focuses on firms providing project-based integrated solutions. The attempt to fill identified research gaps is carried out by answering three questions: What roles the frontline service providers, project manager and team members, play in project-based integrated solution? How service providers can influence organizational dynamic capabilities in project-based integrated solution? What mechanisms service providers can adopt to develop dynamic capabilities in project-based integrated solution?

The theoretical foundation of this thesis is built on dynamic capability and servitization literatures, complemented by researches on project-based organizations. The empirical data are collected in semi-structured interviews. In this thesis, the strategic roles which project manager and team members play, and their respective influences upon organizational capabilities are differentiated. Meanwhile, the roles of service cocreators on customer side are studied and the influence on project performance are discussed. Overall, this study is qualitative in nature and the theory development follows a deductive in combination with inductive approach.

This study creates multiple theoretical contributions. Knowledges about the roles of frontline service providers, their influence upon organizational capabilities, the micro-foundations of dynamic capabilities, and the influence of service co-creators in project-based integrated solution are developed. This study also generates insights for managers to reconsider firm organizational structure, decision-making processes, human resource and knowledge assets management in solution projects. Additionally, this study indicates

that, to improve project performance, managers should emphasize the importance of service cocreators and develop their capabilities.

**Keywords: Project-based integrated solution, Service Providers, Service Cocreators
Dynamic Capabilities, Micro-foundations, Mechanisms**

1. INTRODUCTION

Researches investigating the servitization of manufacturing firms can date back to the 1980s and since then numerous works analyzing this trend and addressing relevant strategic challenges have been published. Servitization is defined as that firms offer not anymore pure physical products but packages or "bundles" of customer-oriented combination of goods, services, support, self-service, and knowledge (Vandermerwe & Juan Rada, 1988: p314; Baines et al., 2009a: p496). The transformation of firms from traditional manufacturing to servitization is prevalent both in developed and emerging markets. For example, after a comprehensive study started from 2007 and covering 10,634 manufacturing firms located all around the world Neely et al. (2011, p.3) revealed that 30.05% of sample firms had completed servitization and, particularly, there is a dramatic leap of transition recorded in China from less than 1% in 2007 to slightly under 20% in 2011.

1.1 Background of the study

Although each firm endeavoring to step outside of traditional business into servitization may have specific concern(s), it is believed that the transformation of servitization is mainly driven by mega trends of this time (Neely et al., 2011, p.1). The offerings servitized firm striving to provide are not only physical goods but bundles of customer-oriented goods, services, support, self-service, and knowledge. Investigating more closely, researches show that solution is ranked among the most common service offerings promoted by servitized manufacturing firms (Neely et al., 2008, p.103-118; 2011, p.6).

It is notable that servitization usually entails remarkable changes and subsequent challenges for servitized firms. For example, firm offerings are changed from pure physical products to bundles of products and services. Correspondingly, firm business model needs to be modified because customer involvement and co-creation will be greatly emphasized in servitization. The rationales are, on the one hand, firm need closely interact with customer to absorb knowledge critical for service creation (Sivula et al., 1997, p.121) and, on the other hand, customer need participate interaction so that can co-create and receive service. To cope with such changes, firm need fundamentally modify its operation structures, decision-making processes among others.

However, extant researches show that, even after major changes, firm may still face uncertain outcomes of servitization. There are numerous researchers claiming that servitization is beneficial for business performance for example to achieve competitive advantage by locking in customers and locking out competitors (Luoto et al., 2016, p.2498), to obtain expanded and stable revenue (Gebauer & Fleisch, 2007, p.339; Brax, 2005, p.142), to gain economic, strategic and marketing advantage (Gebauer & Fleisch, 2007, p.338), and to increase customer satisfaction and loyalty (Baines et al., 2009b, p.558; Luoto et al., 2016, p.2499-2500). In the contrast, there are also researchers indicate that the outcomes of servitization may not necessarily be positive. For example, Neely (2008, p.103) finds that some servitized firms, especially large firms, achieve lower profit margins and are more likely to declare bankruptcy than pure product manufacturers; Gebauer et al. (2005, p.21-23) report that servitized manufacturers may experience implementation issues and, in some situations, may even result in decreased performance, i.e. the so-called servitization paradox (Gebauer et al. 2005, p.14-15); Researchers such

as Kowalkowski et al. (2015, p.59-69) suggest that the established assumptions about the benefits of servitization should be reconsidered. These contradictory claims call for researchers to carry out more close investigation into the idiosyncrasies of service provision and to analyze the determinants of successful servitization.

As the core elements of servitization, services are defined as the application of specialized knowledge and skills through deeds, processes, and performances for the benefit of customer (Vargo & Lusch, 2004, p.2). Grönroos (2006, p.319) further points out that service provision is processual in nature, which fundamentally differentiates service provision from product provision. While physical products are produced in closed production processes, services are co-created by suppliers and customers and the consumption and production of services are at least partly simultaneous processes. Therefore, servitization to employees of servitized firms is not merely delivering pre-made products but processes of identifying customer needs, assessing opportunities, and mobilizing resources to address opportunities and capture value. Moreover, every process of service provision needs continuous renewals (transforming) and always is participated by customers. As a result, the performance of service provision to large extent is determined by servitized firm developing servitization-specific dynamic capabilities to address rapid changing environment including changing customer needs. Moreover, the inevitable customer co-creation implies that not only the service supplier but also the customer will considerably influence the performance of servitization.

1.2 Research gaps

While most of servitized manufacturing firms providing integrated solutions as offerings, the provisions of solutions are often carried out by project teams. Correspondingly, research focusing on project-based integrated-solution is categorized as one of essential clusters within servitization research community (Rabetino et al., 2018, p.353). This study targets project-based integrated solution and the research gaps are located on the intersection of multiple research areas including strategic management, servitization, project management and international business.

It is widely recognized that firms seeking sustainable competitiveness in rapidly changing environment need develop specific dynamic capabilities. In strategic management literatures dynamic capabilities are defined as higher-level competences that determine the firm's ability to integrate, build, and reconfigure internal and external resources /competences to address, and possibly shape, rapidly changing business environments (Teece, 2012, p.1395; Teece et al. 1997, p.515). Examining the nature of dynamic capabilities, they are rooted in high performance routines, i.e. patterns of collective activities built up on the base of organizational knowledge (Teece, 1994, p. 537-545). In addition, because organizational knowledge is generated by learning activities, including individual and organizational, so that learning is recognized as one of essential processes which can foster dynamic capabilities (Teece, 1994, p. 537-545). Teece pushes the study of firm competitive advantage from dynamic capability perspective further onto micro level. He (2007, p.1319) defines the micro-foundations of dynamic capabilities as distinct skills, processes, procedures, organizational structures, decision rules, and disciplines, and claims these micro-foundations undergird organizational sensing, seizing, and reconfiguring capacities. However, extant strategic management theories are mostly

derived from researches focusing on traditional manufacturing industry, where business operations are overwhelmingly product-oriented and organizational structures are pervasively hierarchical. Therefore, according to extant strategic management theories organizational dynamic capabilities are resided in large measure within firm top management team (TMT) (Teece, 2007, P. 1346).

When integrated solution is executed and delivered to customer in form of project, firm will face not only challenges derived from rigid time, budget and quality requirements but also challenges caused by the idiosyncrasies of service provision. First and foremost, services are created by service providers through exploiting knowledges and skills so that it is frontline service providers, not top managers, play decisive roles in service provision. In project-based integrated solution, while project manager acts as the single most important role every frontline project member also plays strategic role to plan and proceed his/her service provision. Secondly, tasks which project team of integrated solution faces for example the compatibility of product and service, the development of new service and the configuration of required resources are subject to much more complexity and uncertainty than tasks in traditional projects. Therefore, every service provider in project team needs higher degree of dynamic capabilities and greater autonomy in decision-making than team member in traditional project does. Thirdly, it's known that service can only be co-created by service provider with its customer, and the consumption of service also takes place with the creation simultaneously (Lovelock & Wirtz, 2004, p.214-218; Grönroos, 2006, p.319). Therefore, the performance of solution project will rely on not only the solution supplier but also on the customer. To explain how organizational dynamic capabilities can be developed in project-based integrated solutions, studies need look deeper into micro-level of business operation. Specifically speaking, the roles which top management, project manager, frontline service providers and service co-creators play and their respective influences upon project capabilities need to be differentiated.

Meanwhile, although researches addressing servitization has started since 1980s, findings about how or through what mechanisms to improve performance or create competitive advantage in servitization are discrete. For example Brax (2005, p.152) emphasizes the importance of recreating firm culture; Neu and Brown (2005, p.10-11) make contribution to redefine product-service relationship; Gebauer et al. (2006, p.378) point out that servitized firms need to reconsider decision-making process and probably allocate high degree of decision-making authority for strategy formation to managers at lower levels of the organization; Brax (2005, p.151-152) also states that a good integrative information system and information management practices are fundamental to providing complex industrial services for installed bases. However, to comprehensively explain how organizational dynamic capabilities can be developed in servitization systematic studies and comparative analysis is needed.

Nevertheless, research findings from project management and international business communities could cast light on these questions. For example, in project management researches scholars conclude that the important decisions constitute the very essence of the project manager's work life (e.g. Parkin, 1996, p.257). Likewise, in international business researches scholars notice that the separation of ownership and control is increasing, and that managers of subsidiaries usually play critical roles in strategic decision-making (Alcácer et al., 2016, p.506-507). Moreover, Alcácer et al. (2016, p.505) find that ICTs could enable multinational enterprise to redesign the boundaries of subsidiary networks and to orchestrate dispersed innovation activities over geographical

and technological distances. These findings imply that in certain type of servitization, for example in project-based integrated solution, decentralized managerial structure may be applicable and project managers may play similar strategic roles. However, to draw this conclusion we need not only solid theoretical foundations but also profound empirical evidences.

Overall, the implementation of project-based integrated solution is built on temporary decentralization, autonomous organizational units, and fluid organizational structures (Söderlund & Tell, 2011a, p.208-214), and is fundamentally influenced by idiosyncrasies of service provision. Extant strategic management theories can only make incomplete explanation in terms of in whom the organizational dynamic capabilities reside and through what mechanisms servitized firm could develop dynamic capabilities. The identified research gaps for this study are how frontline service providers, for example project manager and team members in project-based organization, may influence organizational dynamic capabilities and how organizational dynamic capabilities can be developed in such servitization.

1.3 Research questions of the study

Focusing on project-based integrated solution, I conduct this study to scrutinize the micro-level influential factors of organizational dynamic capabilities. The attempt of filling aforementioned gaps is carried out in three steps: first, to identify the roles which frontline service providers, project manager and team members, play in project-based integrated solution; second, to analyse the influences of service providers upon organizational dynamic capabilities in project-based integrated solution; third, to study what mechanisms service providers can leverage to develop dynamic capabilities in project-based integrated solution. Thus, research questions can be formulated as:

RQ 1: What roles the service providers, project manager and team members, play in project-based integrated solution?

RQ 2 How service providers can influence organizational dynamic capabilities in project-based integrated solution?

RQ 3: What mechanisms service providers can leverage to develop dynamic capabilities in project-based integrated solution?

This thesis is built on a theoretical foundation consisting of dynamic capability and servitization literatures and complemented with findings from researches on project-based organizations. First, I conduct literature review to grab the knowledge about the strategic actors in project-based integrated solution and their respective influences upon organizational dynamic capabilities. Then, I launch series of semi-structured interviews to collect empirical data on potential strategic roles of service providers, their influence on organizational capabilities, and mechanisms to develop capabilities.

Firms in water treatment industry popularly provide integrated solutions to customers and organize the deliveries of such solutions in projects. Meanwhile, many manufacturing

firms in China water treatment industry share the similarity of being at the early stage of servitization and facing critical challenges derived from service provision. Therefore, I choose sample companies from China water treatment industry to conduct an empirical study, seeking to identify the typical patterns and find answers for research questions. In this study, the strategic roles of project manager and team members and their respective influences are differentiated. Meanwhile, data in relation with the service cocreators are also collected and analysed, and the influence of service cocreators on project performance is discussed.

1.4 The expected contributions

This study potentially will generate theoretical contributions in four folds: First, it will broaden the understanding of the roles frontline service providers could play; second, it will deepen understanding of the frontline service providers' influence on organizational capabilities; third, it will explore the micro-foundations of dynamic capabilities in servitization; and fourth, it may also provide preliminary findings about the influence of service co-creators. Meanwhile, this study will also bring multiple managerial contributions. For example, it will provide insights for managers to reconsider firm organizational structure, decision-making processes, human resource and knowledge assets management in servitization. Moreover, it could identify applicable mechanisms for firms to develop capabilities in project-based integrated solution. Furthermore, this study may also reveal what influence the service cocreators could have upon project performance. Finally, this study is expected to generate various societal contributions both for enterprises, education institutes as well as individuals.

1.5 Structure of the thesis

This thesis consists of five chapters. The first two chapters constitute the theoretical part. The first chapter introduces the background of this study, the process to identify research gaps, formulated research questions, and the overview of this thesis. The second chapter is literature review including strategic management stream, servitization stream, project-based organization researches, and ended in synthesizing and making propositions.

The third chapter introduces the methodology applied in this study. It starts off from explanation of research philosophy, followed by introductions of theory development approach, research strategy and methods, choosing case companies, data collection and analysis, and finally ended by studying the validity and reliability of this study.

The fourth chapter summarizes empirical findings. It includes six sections: introduction of the projects and the market, displaying different strategic choices and underneath concerns, introducing the roles of project manager and their expected capabilities, introducing the roles of project team members, influence of service providers upon team dynamic capabilities, and summarizing capabilities development mechanisms.

In last chapter, evidences from empirical study will be analyzed and finally conclusion will be made. It includes six sections and the first three sections are answers to research questions: roles of service providers in project-based integrated solution, the influence of service providers upon organizational dynamic capabilities, capabilities development mechanisms in project-based integrated solution. Then, theoretical implication and managerial implication will be listed. Finally, limitations will be discussed, and future research directions will be suggested.

2. LITERATURE REVIEW

It is suggested that early researchers who study business performance from industrial organization (IO) perspective typically view industry as a homogeneous unit where firm superior profit rests on the structure within industries and on industrywide traits of market structure (Porter, 1979, p.214). Later, researchers like Barney (1995, p.50-57) claim that valuable, rare, inimitable and organization supported resources (VRIO) will lead to firm sustainable competitive advantage. However, these researchers fall short of considering the dynamism of firm and environment until Teece & Pisano (1994, p.537) explain competitive advantage from dynamic capabilities perspective.

Because service is series of activities (Grönroos, 1988, p.10) service provision is considered as changing process in nature. In this thesis, the study of servitization performance will start off from observing the source of dynamic capabilities, i.e. what roles service providers play in servitization and how they influence organizational dynamic capabilities. The theoretical foundation of this study will be built on the intersection of strategic management research and servitization research and be complemented with insights from literatures investigating project-based organizations and international subsidiaries.

2.1 Sustainable competitive advantage and dynamic capabilities perspective in strategic management researches

According to resource-based-view firm competitive advantage lies 'upstream' of product markets and rests on a collection of routines, skills, and complementary assets that are difficult to imitate (Teece, 1994, p.549). Typically, in knowledge intensive or high-tech industries firm-specific skills and knowledges constitute the main part of such rare, valuable, difficult-to-imitate and not available from market resources. Meanwhile, learning and knowledge management play crucial role in capturing, transferring and replicating these strategic resources. Firms upholding 'resource-based strategy' typically invest heavily in advanced, usually also expensive and not yet commercialized, technology assets and employ aggressive intellectual property protection policy (Teece & Pisano, 1994, p.537).

However, numerous reports about "big and strong" companies falling from admired market position with intact technologies and patents have clearly revealed that only possessing valuable resources is insufficient for firms to secure competitive advantage. Dating back to 1950s, Penrose's (1959, cited by Wang & Ahmed, 2007, p.32) early day contribution has shed light on this kind of phenomenon which RBV cannot explain convincingly. She claims that value creation will not come from the possession of the resources but from the use of resources. She also points out that manager's limited knowledge will constrain firm development and, furthermore, she suggests managers should have entrepreneurial skills rather than merely managerial skills. While she defines 'an entrepreneurial competence is a function of imagination whereas a managerial competence is largely practical execution', it's highlighted that managers are expected to exploit firm resources to deal with changing competitive landscape. In this context the firm survival and competitive advantage are to great extent rely on the efficient dynamism of both individual knowledge and organizational knowledge.

Teece et al. (1997, p.515) expands the theoretical paradigm of 'dynamic capabilities' to explain how competitive advantage is gained and held in long run. "Dynamic" refers to the capacity to renew competences so as to achieve congruence with the changing business environment, and "Capability" emphasizes the key role of strategic management in appropriately adapting, integrating, and re-configuring internal and external organizational skills, resources, and functional competences to match the requirement of a changing environment. He further points out that dynamic capabilities rest on distinctive processes (ways of coordinating and combining), shaped by the firm's (specific) asset positions (such as the firm's portfolio of difficult-to-trade knowledge assets and complementary assets), and the evolution path(s) it has adopted or inherited (Teece, 1997, p.509). Beside Teece, other scholars also study the role of dynamic capabilities in firm strategy and their fundamental influence on business performance (Eisenhardt and Martin, 2000; Zahra, Sapienza and Davidsson, 2006; Winter, 2003).

However, the way dynamic capabilities precisely affecting business performance remains unclear since the lack of empirical studies and convincing findings about the enabling mechanisms. Scholars such as Eisenhardt and Martin (2000, p.1117), Winter (2003, p.8), Zahra, Sapienza and Davidsson (2006, p.944), among others, suggest that competitive advantage does not come from dynamic capabilities themselves but from the new configurations of resources and operational routines resulting from them. Empirical evidence in knowledge management literature also suggests that, in order to achieve a better understanding of knowledge management performance, companies should attempt to link knowledge processes and resources with intermediate outcomes that transform knowledge into business value (Easterby-Smith & Prieto, 2008, p.245). As defined earlier, operational routines or capabilities are the visible outcome of dynamic capabilities. These capabilities are geared towards the operational functioning of the firm and can affect performance measures and lead to above-average returns.

In order to discover the enabling mechanisms of firm performance and, most importantly, to discover the latest research findings in relation with this topic I conduct a comprehensive literature review ranging from RBV, dynamic capability perspective and micro-foundations of dynamic capabilities. In later sections findings will be displayed following the threads of who develop dynamic capabilities? Through what mechanisms to develop dynamic capabilities? And, how these dynamic capabilities affect business performance?

2.1.1 Resources-Based View

There are many researches investigating the source of business performance and sustainable competitive advantage are conducted from resource-based view (RBV). The RBV is looked as a complement to the industrial organization (IO) researches or industrial economy researches with Porter as one of its main representatives. While the IO view putting the determinants of firm performance outside the firm, in its belonging strategic group and the relevant industry's structure (Porter, 1979, p.218-219), the RBV explicitly looks for the internal sources of sustainable competitive advantage (SCA) and aims to explain why firms in the same industry might differ in performance (Kraaijenbrink et al., 2010, p.350).

Barney (1995, p.50) defines resources as all assets that are controlled by organizations and enable organizations to idealize and create effective strategies. Those assets can be classified into financial, physical, individual and organizational resources. Integrating with environment attributes, the RBV describes conditions under which distinctive resources and capabilities possessed by a firm are sources of competitive advantage (Barney, 1995, p.49-50).

For almost two decades scholars in strategy and management research field have acknowledged that resources with VRIO attributes lead to firm sustainable competitive advantage, so that those are strategic resources. The VRIO analysis framework (Barney, 1995, p.50-57) represents the principles of RBV and is a simplified tool to identify strategic firm resources which are valuable, rare, difficult to imitate or substitute, and with organizational support. Specifically, strategic resources must be: first, of great value (V) and able to empower organization to successfully respond to environmental opportunities or threats; second, rare (R) so that no or few competitors can possess; third, difficult and costly for competitors to obtain and imitate (I); and finally, not sufficiently able to foster sustainable competitive advantage unless they are organizationally (O) supported and appropriately exploited.

However, there are lots of critiques pointed to early stage RBV research, for example Kraaijenbrink et al. (2010, p.352) argue we have no reason to oblige the RBV to generate theoretically compelling prescriptions. Lockett et al. (2009, p.17) conclude that there may be no discernible relationship between firm performance and the possession of specific resource. There are concerns that RBV can easily be misunderstood as that persistent accumulation of firm core resources was a better strategy than continuously adapting to changing environment. Managers holding RBV are more likely to assume that firms with abundant resources were strongly competitive and able to survive and develop, regardless of external environmental changes (Wang & Ahmed, 2005, p.40-41). In some special cases, researchers also noticed that some firms holding 'resource-based strategy' attempt to accumulate large stock of valuable technology assets but still do not have many useful capabilities (Teece, 1994, p.538).

Likewise, numerous real cases have also shown that possessing resources can neither automatically generate superior competencies nor necessarily create competitive advantage. More and more researchers (e.g. Penrose, 1959; Teece; Eisenhardt and Martin, 2000, p.1108; Wang & Ahmed, 2005, p.40-41) have noticed to survive challenges coming from market dynamism and to maintain long-term superior performance firm cannot only rely on static resources but need to develop dynamic capabilities.

2.1.2 Dynamic capability perspective

Organizational capabilities are defined as a firm's capacity to deploy its resources, tangible or intangible, to perform a task or an activity, usually in combination with and using organizational processes, and to create organizational rent or improve performance (Amit & Schoemaker, 1993, p.33; Teece, 2012: p1395-1400). The rapid changing characteristics of market environment together with the shifting trends of internationalization, digitalization, servitization etc. entail enormous challenges for firms

and call for researchers casting more light on specific firm capabilities to deal with market dynamism.

Since 1990s, Teece et al. (1997: p516) among other researchers address firm performance from dynamic capability perspective and they define firm dynamic capabilities as the abilities to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments. Eisenhardt and Martin (2000, p.1107) extended the definition of Teece et al. to include “shaping the environment”. Teece et al. (1997: p515) identified that there are three core building blocks, i.e. processes, positions, and paths underpinning firm dynamic capabilities. Later, Teece (2007: p1319) categorize firm dynamic capabilities into three domains including sensing, seizing, and transforming.

Empirical work of dynamic capabilities has encompassed market dynamism as a key driver for firm evolution (Wang & Ahmed, 2007, p.32-35). The origin of the theories of dynamic capabilities perspective could trace back to Penrose's (1959, cited in Wang & Ahmed, 2007, p.32; Penrose, 1960, p.2-3 cited in Lockett, 2005, p86) ground-breaking ideas in which she emphasizes that value creation does not come from the possession of the resources but from their use. Furthermore, she emphasizes the continuous dynamism of firm with market environment, and the entrepreneurial skills by which managers can image all possibilities. Eisenhardt and Martin (2000, p.1107) stress the importance of dynamism and process by defining dynamic capabilities as organizational and strategic routines, i.e. to integrate, reconfigure, gain, and release resources and by which firms achieve new resources configurations as markets emerge, collide, split, evolve and die.

Researchers traditionally view firm resources and capabilities as in a ‘hierarchical’ order. Collis see capabilities required for functional activities as first category capabilities, capabilities enabling dynamic improvement of firm activities as second category capabilities and, above all, there should be higher order capabilities of the “learning to learn” variety. (Collis, 1994, p.145-146). Wang & Ahmed (2007, p.35-36) view firm resources and capabilities as in a ‘hierarchical’ order: Resources are the ‘zero-order’ element of the hierarchy and the basis for firm capabilities; Capabilities constitute the ‘first-order’ and are developed to deploy resources in order to improve firm performance; Core capabilities are the ‘second-order’, consisting of a bundle of resources and capabilities which are strategically important to firm competitive advantage at certain point of time; Dynamic capabilities are the ‘third order’, which emphasise a firm’s constant pursuit of the renewal, reconfiguration and re-creation of resources, capabilities and core capabilities to address the environmental change.

As a comparison, Teece emphasizes both the hierarchical and processing characteristics of firm dynamic capability. He stresses that dynamic capabilities are higher-level competences that determine the firm’s ability to integrate, build, and reconfigure internal and external resources/competences to address, and possibly shape, rapidly changing business environments (Teece,2012, p.1395; Teece et al., 1997, p.515). Moreover, firm knowledge base is highlighted as critical resource for firm performance and guided learning is recognized as one of essential processes which can foster dynamic capabilities (Teece, 2014, p.16).

However, in traditional strategic management researches the primary focus was put on firm-level or macrolevel capabilities and outcomes. Within hierarchical organizational structure, firm strategizing was exclusively carried out by top managers. Therefore,

organizational dynamic capabilities are pervasively perceived as residing in firm top management team.

2.1.3 Micro-foundations of dynamic capabilities

Teece (2007, p.1319) defines micro-foundations of dynamic capabilities as distinct skills, processes, procedures, organizational structures, decision rules, and disciplines, which will undergird firm-level sensing, seizing, and reconfiguring capacities. Previously, Eisenhardt and Martin (2000, cited in Teece 2007, p.1322) identify important elements (micro-foundations) of dynamic capabilities such as cross-functional R&D teams, new product development routines, quality control routines, technology transfer and/or knowledge transfer routines, and certain performance measurement systems. Other micro-foundations for example transactive memory system (Argote & Ren, 2012, p.1379-1380) and managerial cognitive capabilities (Helfat & Peteraf, 2015, p.837) are also well recognized in strategic management community.

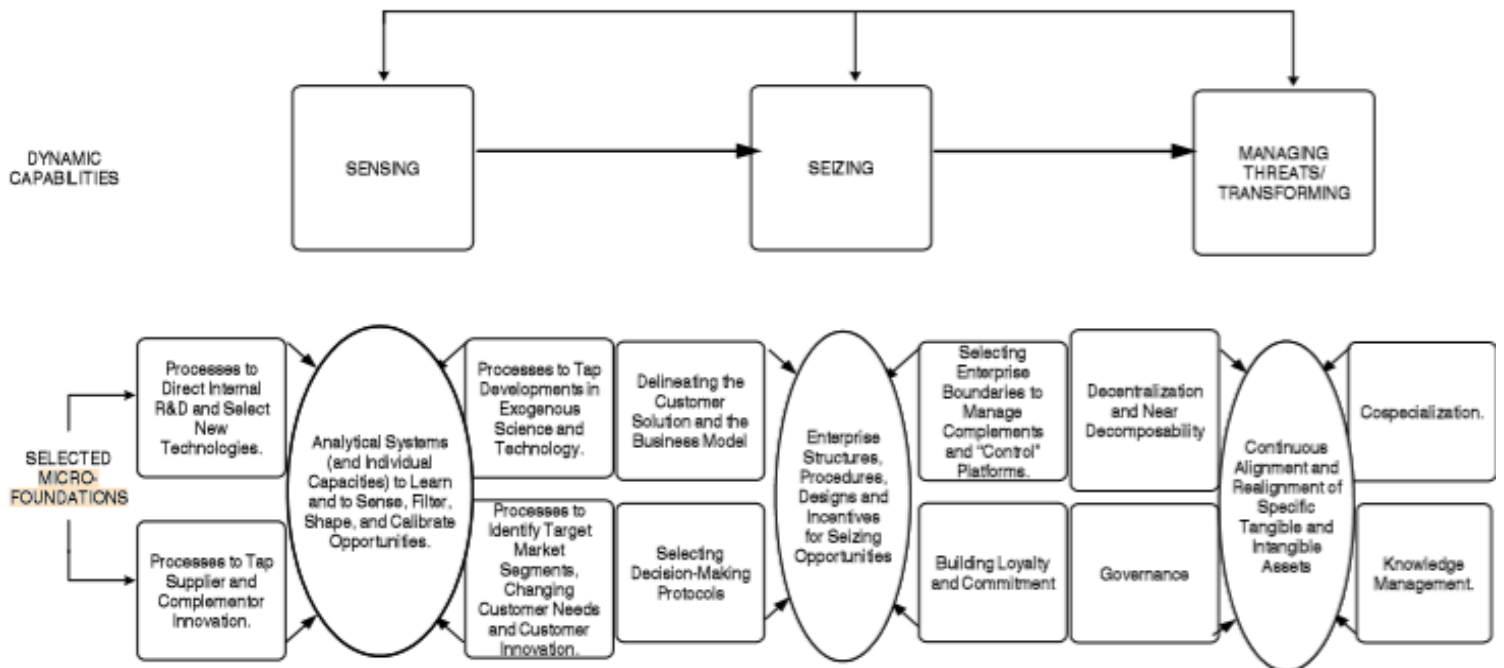


Figure 1: Foundations of dynamic capabilities and business performance (Teece, 2007, p.1342)

Synthesizing concepts and research findings from strategic management, social and behavioral sciences, Teece (2007, p.1341-1344) introduce a framework illustrating the micro-foundations of dynamic capabilities categorized in three themes. Micro-foundations working around sensing capabilities are processes to direct internal R&D and select new technologies, processes to tap supplier and complementor innovation, processes to tap developments in exogenous science and technology, and processes to identify target market segments, changing customer needs and customer innovation. Micro-foundations supporting seizing capabilities are delineating the customer solution

and the business model, selecting decision-making protocols, selecting enterprise boundaries to manage complements and control platform, and building loyalty and commitment. Micro-foundations undergird transforming capabilities include decentralization and near decomposability, governance, cospecialization, and knowledge management.

Teece (2007, p.1347) suggests that enterprises must build and utilize all three classes of capabilities and employ them simultaneously. Because individual managers may possess capabilities differently, so that it is crucial for firm to have all these capabilities represented and functional in top management team. As usual, in his 2007 article Teece still highlighted the salient importance of the principal executive officer. He states that, as a primary foundation, firm performance will rely on the principal executive officer to successfully get all top management to operate as a team. More importantly, if the CEO has depth in all three classes of capabilities, the organization has a better chance of success (Teece, 2007, p.1347).

While CEO and top management team are traditionally emphasized, researchers also notice that middle managers and ordinary employees can more easily access information about technology, customer and market. Teece et al. (1997, p.521) also agree that decentralized organizational structure and greater local autonomy can make firms more aware about market and technological developments. As a result, although Teece (2007, p.1346) claim that dynamic capabilities reside in large measure with the enterprise's top management team, he proposes firms could establish internal councils or other integration forums to create a collaborative nonhierarchical management style (Teece, 2007, p.1336). Because information will decay when it moves up (or down) a hierarchy, firms must be equipped with mechanisms and procedures to keep top management being informed sufficiently.

Particularly, Teece emphasize entrepreneurial managers' managerial capabilities in his 2007 article. Here entrepreneurial management has little to do with analyzing and optimizing operational issues but is more about sensing and seizing, figuring out the next big opportunity and how to address it (Teece, 2007, p.1346). He argues that firms with strong dynamic capabilities are intensely entrepreneurial. Firms with entrepreneurial character are not only capable of adapting business ecosystems but also shaping them through innovation and through collaboration with other enterprises, entities, and institutions (Teece, 2007, p.1319). He points out that managers with entrepreneurial mindset can sense and even help shape the future, delink the enterprise from the past, and, most importantly, keep leading position by augmenting knowledge assets. Entrepreneurial managers should emphasize knowledge management, protecting intellectual properties, establishing new combinations of value enhancing assets, and transforming organizational, regulatory or institutional structures if needed.

Teece's emphasis on distinct traits of talented individual as micro-foundation of firm dynamic capability can be seen in his later study, in which he points out that at least part of dynamic capabilities is embedded in non-routine entrepreneurial activity (Teece, 2012, p.1399). He further clarifies that only few entrepreneurial managers, usually top management, can possess such capabilities and fundamentally influence firm competitive advantage (Teece, 2012, p.1397). As Job's personnel influence in innovation at Apple's shows that entrepreneurial managers can play critical roles in both transforming the enterprise and shaping the ecosystem through sui generis strategic acts that neither stem from routines (or algorithms) nor need give rise to new routines (Teece, 2012, p.1395).

Similarly, Felin et al. (2012, p.1) also identify individuals as one of three primary categories of micro-level components underlying routines and capabilities, together with social processes or interaction of individuals, and organizational structure and design. Similar micro-foundations are what Argote & Ren (2012, p.1379-1380) identified transactive memory and what Helfat & Peteraf (2015, p.837) stressed managerial cognitive capabilities, which are all closely in relation with key players' individual dynamic capabilities.

In sum, the theories studying micro-foundations of dynamic capabilities opens the door for scrutinizing individual capabilities, especially entrepreneurial manager's dynamic capabilities. It also calls for digging deeper into the linkages between individual or small-group managerial actions, dynamic capabilities, and long run firm performance. By studying micro-foundations of dynamic capabilities in nonhierarchical management system, researchers could have chance to disclose the strategic roles of middle managers and even ordinary employees. Specifically, their individual dynamic capabilities embedded in distinct sensing, seizing and transforming actions and skills.

2.1.4 The interrelationships among knowledge, learning & dynamic capability

The importance of knowledge and learning is constantly stressed in dynamic capability view. Teece et al. defines dynamic capabilities as 'the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments' (Teece et al., 1997, p.516) and knowledge assets are treated as essential firm resources. Moreover, it is claimed that guided learning is one of three key processes underpinning dynamic capabilities (Teece, 2014, p.16). In the contrast, it is believed that operational capabilities are embedded in organizational processes and the day-to-day routines of employees.

Regarding the importance of knowledge asserts, Teece (1998, p.76) suggests that the key resources of wealth creation in new era will lie within new enterprise formation; the renewal of incumbents; the exploitation of technological know-how, intellectual property, and brands; and the successful development and commercialization of new products and service. Likewise, Penrose (1959 cited in Ambrosini & Bowman, 2009, p.32-33) suggests that firm growth is constrained by manager's knowledge of their firm's resource base and their understanding of their external environment. In addition, Vargo & Lusch (2004, p.7) claim that Knowledge and skills represent "operant resources" which are the foundation of competitive advantage. Similarly, Eisenhardt and Martin (2000, p.1112) stress that a firm's dynamic capabilities' focus is on rapidly creating situation-specific new knowledge. Summarizing aforementioned claims, we can conclude that knowledge base sets the foundation for business performance and firm dynamic capabilities rely on creation of situation-specific new knowledge. Likewise, Ballantyne and Varey (2006, p.340) argue for a change from "knowledge" to "knowledge renewal" to emphasize their contention that knowledge renewal processes operating at the micro (firm, employee) level are primary to competitive advantage and can be activated by communication and dialog (Ballantyne 2004, cited in Ballantyne & Varey (2006, p.337).

Teece et al. (1997, p.520) define learning is a process by which repetition and experimentation enable tasks to be performed better and quicker. Learning involves organizational as well as individual skills. Meanwhile, learning processes occur not only through the imitation and emulation of individuals but also through understanding of complex problems. Furthermore, the organizational knowledge generated in learning activities reside in new patterns of activity, in ‘routines,’ or a new logic of organization.

It is believed that learning plays a significant role in the creation and development of dynamic capabilities. Teece et al. (1997, p.518) originally discover three organizational processes underpinning firm dynamic capabilities: coordination/integration; guided learning; and reconfiguration/ transformation. Bowman and Ambrosini (2003, p.301) further developed Teece’s definition of dynamic capability and call attention to learning process. They claim dynamic capabilities comprise four main processes: reconfiguration, leveraging, learning and creative integration, where learning will allow tasks to be performed more effectively and efficiently through experimentation, reflecting on failure and success. Likewise, researchers such as Eisenhardt & Martin (2000) and Zollo & Winter (2002, p.340-341) coincidentally claim that learning is at the base of dynamic capabilities and guides their evolution. Particularly, Zollo and Winter (2002) consider dynamic capabilities to be the result of learning to shape operational capabilities and claim learning may itself be considered as a ‘second-order’ dynamic capability.

To draw a brief summary of aforementioned claims, the interrelationships among knowledge, learning, operational capabilities and dynamic capabilities are scrutinized step by step: first, knowledge base sets the foundation for business performance and firm dynamic capabilities (Teece, 1998, p.76; Ambrosini & Bowman, 2009, p.32-33); second, firm dynamic capabilities rely on creation of situation-specific new knowledge (Eisenhardt & Martin, 2000) or knowledge renewal processes operating at the micro (firm, employee) level (Ballantyne and Varey, 2006, p.340); moreover, learning could be seen as one of fundamental processes to develop dynamic capabilities beside reconfiguration, leveraging and creative integration (Bowman & Ambrosini, 2003, p.301), and is at the base of dynamic capabilities and guides their evolution. Finally, with regard the function of learning to shape operational capabilities, learning may itself be considered as a ‘second-order’ dynamic capability (Zollo & Winter, 2002).

2.1.5 Learning and knowledge management mechanisms to develop dynamic capabilities

Knowledge management, i.e. creating, acquiring, storing and deploying knowledge are the fundamental organizational activities of firms (Grant, 1996, p.120-121). While the dynamic capabilities view emphasizes the renewal of resources by reconfiguring them into new capabilities and competences (Teece et al., 1997, p.516), knowledge management research often focuses on providing solutions to managers to create, retain, transfer and use an enterprise’s explicit and tacit knowledge (Cepeda and Vera, 2005). Knowledge Management or information management was originally defined as: “the process of acquiring, sharing, and effectively making use of knowledge” (Davenport, 1994, p.119). Likewise, Argote et al. (2003, p.571) indicate the outcomes of knowledge

management are knowledge creation, retention, and transfer. In management researches authors such as Argote et al. (2003, p.571-582) use "organizational learning" and "knowledge management" parrallelly. It's believed that firms successfully employing knowledge management strategies can create dynamic capability to better mobilise knowledge assets, so that improve sensing and seizing capabilities to better take advantage of opportunities as well as mitigate risks. For example, Storey and Kahn (2010) find that firms can implement knowledge codification and personalization strategies in service innovation to seek sustainable competitive advantage.

SECI is a renowned model to guide knowledge management strategy. According to SECI model, the new knowledge is created in a "knowledge spiral" process (Nonaka, 1991, p.97-99; Nonaka & Toyama, 2003, p.4-5) which is continuous interaction between explicit knowledge and tacit knowledge through socialization (S), externalization (E), combination (C) and internalization (I). Explicit knowledge is defined as formal and systematic knowledge which can be easily communicated and shared in product specifications or a scientific formula or a computer program. On the contrary, tacit knowledge is highly personal and difficult to communicate to others, and deeply rooted in action and in an individual's commitment to a specific context for example a craft or profession, a specific technology or product market, or the activities of a work group or team. By definition, socialization refers to the process of sharing and creating tacit knowledge through direct experience in environment; Externalization means articulating tacit knowledge through dialogue and reflection into explicit format; Combination is systemizing and applying explicit knowledge and information including processes of gathering and integrating, transferring and diffusing, and editing explicit knowledge; Internalization refers to the process of knowledge being applied and used in practical situations and becoming the knowledge of one's own.

Teece (1997, p.520) defines learning as a process in which repetition and experimentation enable tasks to be performed better and quicker, and guided learning is one of the most important processes underpinning dynamic capabilities. He points out that learning involves organizational as well as individual skills. In addition, the organizational knowledge generated by such activity resides in new patterns of activity, in 'routines,' or a new logic of organization (Teece,1997, p.520). Other scholars have studied different organizational learning mechanisms by which firm dynamic capabilities could be fostered. For example, March (1991, p.71) studied the relation between the exploration of new possibilities and the exploitation of old certainties in organizational learning. He concludes that both exploration and exploitation are important learning processes and suggest that improving the balance between exploration and exploitation is essential for learning outcomes. March (1991, p.83) stresses that the essence of exploitation is the refinement and extension of existing competences, technologies, and paradigms and the returns of exploitation are positive, proximate, and predictable; meanwhile, the essence of exploration is experimentation with new alternatives but its returns are uncertain, distant, and often negative.

Drawing on arguments derived from behavioral and cognitive traditions in organizational learning studies, Zollo and Winter (2002, p.344) conclude that dynamic capabilities are systematic patterns of organizational activity aiming to generate and adapt operating routines. They summarize that dynamic capabilities develop through the co-evolution of three learning mechanisms: tacit accumulation of past experience, knowledge articulation and knowledge codification processes. They further point out that, at any point in time,

firms need adopt a mix of learning behaviors constituted by a semiautomatic accumulation of experience and by deliberate investments in knowledge articulation and codification activities. Similarly, but at a practical level, Zollo and Winter (2002, p.344) argue that it is possible to organize ‘learning mechanisms’ of experience accumulation, knowledge articulation and codification which encapsulate these learning processes. And more specific organizational practices such as skill development, mentoring and reward systems are reported by Easterby-Smith and Prieto (2008, p.244) as leading to the development of capabilities. These learning mechanisms enable the configuration and reconfiguration (i.e. dynamic capabilities) of the firm’s operational resources and routines (Cepeda & Vera, 2005, cited in Easterby-Smith and Prieto, 2008, p.244), and are catalyzed by the management of the firm’s knowledge resources.

Beside learning mechanisms, organizational learning literature has also explicitly discussed the development of a learning system or infrastructure that affects and is affected by learning processes (Vera & Crossan, 2003, cited in Easterby-Smith and Prieto, 2008, p.244). This learning infrastructure consists of embedded learning in the technical procedures and social relationships that are pooled through knowledge management. Additionally, Konttinen et al. (2011, p.91) identified and constructed six categories of knowledge transfer mechanisms to create service capability, which are Media; Training; Project cooperation; Communities; Partnerships, and Infrastructures and Resources.

Furthermore, Teece (2007, p.1339) also call to pay more attention to the governance and incentive structures designed to enable learning and the generation of new knowledge. He stresses that good incentive design together with the creation of learning, knowledge-sharing, and knowledge integrating procedures are all critical to business performance and are key (micro)foundations of dynamic capabilities (Nonaka and Takeuchi, 1995; Chesbrough, 2003). Meanwhile, monitoring and managing the ‘leakage,’ misappropriation, and misuse of know-how, trade secrets, and other intellectual property are of equal importance (Teece, 2007, p.1339).

As a brief conclusion: Knowledge Management is the process of acquiring, sharing, and effectively making use of knowledge (Davenport, 1994, p.119), and it is critical for developing dynamic capabilities. In practice firm could employ learning mechanisms to accumulate experience, articulate knowledge and code knowledge (Zollo & Winter, 2002, p.344-346). Recommended capabilities developing mechanisms are for example skill development and mentoring (Easterby-Smith and Prieto, 2008, p.244); media, training, project cooperation, communities, and partnerships (Konttinen et al., 2011, p.91). Meanwhile, Konttinen et al. (2011, p.91) and Vera & Crossan (2003) all stress the importance of infrastructures and resources applicable for learning and capabilities development. Furthermore, both Easterby-Smith & Prieto (2008, p.244) and Teece (2007, p.1339) point out that reward system or governance and incentive structure are also important learning and knowledge management mechanisms critical for productive capabilities development.

2.1.6 Individuals which dynamic capabilities are reside in

In traditional strategic management literatures, the key actors of strategy formulation and strategic learning are exclusively CEOs and top management teams (TMTs). For example, both Teece (2012, p.1397) and Helfat & Peteraf (2015, p.837) focused on firm top executives and suggest that their cognitive capabilities are essential factor to underpin firm dynamic managerial capability for sensing, seizing, and reconfiguring, and explained their potential impact on strategic change of organizations.

However, while most of researchers becoming more and more aware of the uneven dispersion of knowledge and capabilities amongst individuals, researchers like Teece start to emphasize entrepreneurial managers' skills of sensing, seizing and transformation for sustainable competitive performance (Teece, 2012, p.1398). As the success of Apple's has illustrated, borrowed from Jobs' own narrative, outstanding Apple product development relies on several parts of routine and at least one part is "something else", which is non-routine strategizing and entrepreneurial activity or, in other words, the Jobs' distinct understanding of the market and an uncompromising insistence on the easiness of use and the appealing design (Teece, 2012, p.1399).

To sum up briefly, although the strategic roles of top management team are pervasively emphasized in extant strategic researches it has hinted that individual dynamic capabilities of entrepreneurial manager, middle manager or even frontline employees should be able to underpin organizational dynamic capabilities significantly. The long-term firm performance is not only related with firm collective capabilities, but also critically influenced by key decision-makers' nonroutine knowledge, skill or expertise. Therefore, scrutinizing individual dynamic capabilities and mechanisms enabling capabilities development, become essential steps when considering how organizational dynamic capabilities could be developed.

2.2 Dynamic capabilities perspective in servitization researches

2.2.1 Introduction of servitization

In recent decades, along with the trends of globalization and digitalization market environment is changing rapidly and becoming more and more transparent. Firm offerings, especially tangible products, are seen easy to be replicated and become commoditized by competitors, leaving firm superior market position vulnerable. It is widely recognized that in recent decades more and more traditional manufacturing firm have strived to employ servitization strategy in order to counteract ever challenging competition as well as react to shifting mega trends (Neely et al., 2011, p.1).

Employing servitization strategy, firm not anymore offer pure physical products but a package or "bundle" of customer-focused combination of goods, services, support, self-service, and knowledge (Vandermerwe & Juan Rada, 1988, p.314; Baines et al., 2009a, p.496). Investigating more closely, research findings have illustrated that the proportion of service in firm offerings is steadily increase. According to Vargo and Lusch's (2004, p.2) definition service is the application of competences (knowledge and skills) by one

entity for the benefit of another. Researches show the competitive advantage of servitized firm relies much more on knowledge-intensive assets than that of traditional product-oriented firms. Therefore, studying how firm can leverage knowledge management methods to develop dynamic capabilities in servitization has become attractive topic.

Baines et al. (2009a, p.496-499) recognize five research communities in relation with servitization: Services Marketing, Service Management, Operations Management, Product-Service System (PSS), and Service Science (SS). After conducting a bibliometric analysis including 1092 well cited articles Rabetino et al. (2018, p.353) identified three salient research communities in servitization area, i.e. the PSS community, the solution business community and the service science community. Particularly, the solution business community consists of three clusters labelled as customer solutions, project-based integrated solutions, and operations management in service transition. Kujala et al. (2011, p.961), based on their study focusing on project-based firms, further suggest that solution can be divided into three types: (1) transactional project deliveries, (2) project led solutions, and (3) life-cycle solutions. According to the empirical analysis of Kujala et al. (2011, p.962) a project-based firm can employ different business models for several project solutions simultaneously.

Many manufacturing firms, especial those previously producing capital-intensive products, have employed servitization strategy and turned away from only providing products to provide integrated solutions. Because integrated solutions are quite often commissioned and delivered in form of project, project-based integrated solution has become pervasive model in servitization. In those integrated solutions, services have a leading role (Vandermeuw and Rada, 1988) and are bundled with offerings of goods, knowledge, support, and self-service (Davies, 2004, p.728; Vandermeuw and Rada, 1988). In some situation, customers of capital-intensive systems are increasingly interested in the life-cycle operation service. Therefore, integrated solution supplier will develop not only additional service components for their project deliveries but also total operation service for customers.

To sum up, manufacturing firms strive to improve competitive advantage by increasing the proportion of service in offerings, leading to the prevalence of integrated solution and operations management especially in capital-intensive industry. Because of the increasing proportion of service in offerings the business performance of servitized firm becomes more and more relying on knowledge-intensive assets and knowledge management capabilities.

2.2.2 Strategic challenges in servitization

Although numerous research findings have proved that servitization strategy can bring positive outcomes for traditional manufacturing firms. For example, it's widely believed that servitized firms can achieve competitive advantage by locking in customers and locking out competitors (Luoto et al., 2016, p.2498), obtaining expanded and stable revenue (Gebauer & Fleisch, 2007, p.339; Brax, 2005, p.142), gaining economic, strategic and marketing advantage (Gebauer & Fleisch, 2007, p.338), and increasing customer loyalty (Baines et al., 2009b, p.558; Luoto et al., 2016, p.2499-2500). However, research findings about the impact of servitization on business performance are usually

contradictory. For example, Neely (2008, p.103) indicates that some servitized firms, especially large firms, will only achieve lower profit margins or are more likely to declare bankruptcy than manufacturing firms. Similarly, Gebauer et al. (2005, p.21-23) also report that servitized manufacturers may experience implementation difficulties and, in some situations, may result in decreased performance. Kowalkowski et al. (2015, p.59-69) even claim that researchers should rethink the established assumptions about the positive benefits of Servitization. These contradictory evidences are summarized as servitization paradox (Gebauer et al. 2005, p.14-15).

Researchers point out that employing servitization strategy entail fundamental challenges to firm. Brax claims that to successfully transform from traditional manufacturing into servitization firm need to be able to adjust to customer's culture (Brax, 2005, p.152) to avoid "servitization paradox". Meanwhile, Gebauer et al. (2006, p.378) find that firms succeeded in increasing service revenues are those running decentralized service organizations with profit-and-loss responsibility. Similarly, Neu and Brown (2005, p.10-11) suggest that companies positioned as service providers should have an integrated product and service division in order to fulfill complex customer needs. Brax (2005, p.151-152) also states that a good integrative information system and information management practices are fundamental to providing complex industrial services for installed bases. In line with this, Galbraith's (2005, p.5-24) research points out that firms should organize around customers and create customer focusing organizational units. In a study focusing on business-to-business services in product-dominant firms, Neu and Brown (2005, p.10-11) found that senior level managers should allocate high degree of decision-making authority for strategy formation to managers at lower levels of the organization. Being closer to customers, lower level managers are seen to be able to understand the complex service needs better and to align operations with those needs better.

To sum up briefly, extant research findings show that firm should not take positive outcome of servitization as granted. To cope with servitization entailed challenges firm are suggested to make strategic changes for example creating service-oriented culture, building customer-centric organizational structure, and integrating product and service processes. Meanwhile, there are suggestions of changing hierarchical decision-making routines and allocating authority of strategy formation to lower level managers. However, systematic studies are still needed in servitization research field to disclose the strategic logic underneath these challenges and the mechanisms to address them.

2.2.3 Knowledge Management Capabilities for Service Development

The development of service offerings or service innovation is particularly important issue not only to service firms themselves but also to whole economy in general. As Love et al. (2010, p.985) indicated after an empirical research focusing on UK service industry that it is service industries instead of manufacturing industries representing the source of new economy growth, emphasizing the salient importance of service innovation in raising regional productivity.

Among increasing attention paid to service development studies in recent decade, some researchers realize that services are assumed to play a subordinate role to the “proper” innovation processes occurring within manufacturing (Howells & Tether, 2004, p.40). Love et al. (2010, p.984) in their literature review and applaud the claim of Den Hertog (2000) and De Jong et al. (2003) that service development is best described as a process of collective problem-solving in which learning within organizations (Cohen & Levinthal, 1989, 1990; and Zahra and George, 2002, p.188) and connections between organizations (Tether, 2005) play the key roles.

In order to understand the challenges in relation with service development, it is necessary to scrutinize the nature of service offering. Comparing with product-oriented business, service-oriented business is knowledge-intensive (Vargo & Lusch, 2004) rather than material-intensive. Konttinen (2011, p.15) claims that knowledge intensity and intangibility are idiosyncrasies of service business. From a Service Dominant Logic (Vargo & Lusch, 2004), the appropriate unit of exchange is no longer the static and discrete tangible good, but the application of capabilities, or specialized human knowledge and skills, for and to the benefit of the receiver. Because knowledge is mostly embodied in people and providing services requires more adaptation than producing products does, service supplier must more extensively exchange knowledge with clients and make more customization.

It is popularly held that extensive interaction with customers and correspondent knowledge and information management are essential for servitization. For example Sivula concludes that close interaction with a client would provide opportunities for business service provider: (1) the utilization of a client's knowledge in service delivery, (2) the absorption of a client's knowledge, (3) the cooperative development of knowledge, and (4) learning-by-doing and other dynamic effects of business relationships (Sivula, 1997, p.130-131). Specifically, because services are expected to solve customer's problems, communicating with and learning from customer is critical for every service supplier to understand customer's needs, to identify the real problems, and to figure out possible solutions for such problems. In addition, to deal with complex production and supply challenges service supplier needs efficient information management to facilitate internal and external supports. Moreover, the marketing and communication challenge also show that sharing information or knowledge with customers throughout the service relationship is crucial for a service supplier to build up trust, instead of keep opportunism (Brax, 2005, p.152), with customers and to maintain long term co-creation of service. Therefore, developing knowledge management capabilities is critical for employees in servitized firm.

Tether (2005, p.179) identify two differences of innovation between manufacturing and service firms in terms of their sources of advanced technologies and their perceived strengths at innovation. To source advanced technologies, Manufacturers usually prefer in-house R&D, purchasing advanced facilities and equipment, and co-innovating with universities and research institutes. In the contrast, service firms and especially those with clear organizational innovation aims will more appreciate external collaboration with customers or suppliers and the acquisition of external intellectual property. When talking about perceived strengths at innovation, manufacturing firms are more likely to underline the “hard” strengths such as technological and R&D competencies, flexible production capacity as well as high efficiency of production facilities. However, service providing firms tend to put more emphasis on the “soft” strengths like the skills and professionalism

of their employees, and on their collaborative interactions with customers, suppliers and trade associations. Tether also indicate that there is no separate innovation pattern named as “service mode” or “manufacturing mode”. Service firms in some circumstance can also seek innovation through possessing advanced technologies or strengths which usually are categorized as manufacturers-only (2005, p.180). Furthermore, In-house R&D can also underpin service innovation, and thus ultimately encourages higher levels of productivity and productivity growth (Love et al., 2010, p.997).

Tether’s conclusions are proved and strengthened by Vargo & Lusch (2004, p.2), who state that services are the direct and the indirect ways to transfer knowledge and skills during the service process, Lovelock and Wirtz (2004), who claim that the production phase of the service provision cannot be disconnected from consumption activity, and Ordanini & Pasini (2008, p.290), who argue that the service provider can only maximize the service exchange benefits with free and open access to the customers knowledge and expertise.

As a brief summary, extant research works have revealed that the nature of service business is transferring knowledge and skills between the supplier and the customer, so that firm should emphasize knowledge management capabilities. It is recognized that service provider’s skills in relation with interaction, collaboration and co-creation with customer are critical for service development as well as advanced technologies or strengths.

2.2.4 By whom and how dynamic capabilities are developed in servitization

Focusing on service industry Lovelock & Wirtz (2004, p.280) claim that frontline employees are a key input for delivering service excellence and competitive advantage. On the contrary, managers in manufacturing industry, even when employing servitization strategy, usually see frontline service providers as pure decision-takers responsible for operational tasks. Just like in traditional strategic management researches, where most of emphasis are put on top managers’ strategic roles when talking about dynamic capabilities and long-term competitiveness. It is suggested that, comparing with dynamic capabilities, ordinary capabilities are rooted more firmly in organizational routines. But even routines can be understood as developed and embedded in the minds of multiple employees, organizational routines including those related to organizational transformation are still believed transcending the individuals involved (Teece, 2012, p.1396). Therefore, the importance of frontline service providers is traditionally underestimated.

After a study focusing on servitized firms Posselt & Roth (2017, p.102) claim that there are profound differences between the reality in service business and traditional believes. Differences lie in for example the knowledge needed for competitiveness in servitization as well as the ways through which required knowledge can be attained. They argue that the ability of the firm’s top managers to perceive and identify specific market preferences, and thus to formulate the strategic logic, depends on the ability of frontline service providers to understand the customer’s processes and activities, and to identify latent customer needs. Posselt & Roth (2017, p.94) propose that the building of in-depth knowledge through customer interactions of front-line employees facilitates the cognitive

flexibility to imagine alternative strategic logics. Given manager's managerial cognitive capabilities are micro-foundations of firm dynamic capabilities (Helfat & Peteraf, 2015, p.837), the findings of Posselt & Roth (2017, p.102) have justified frontline service providers' strategical roles in servitization.

Taking a dynamic perspective, Posselt & Roth (2017, p.102) interpret the roles of frontline service providers as building and leveraging competencies within all system elements. Their assertion is based on three processes: Firstly, through interaction with customer service providers will generate information such as feedback about the on site situation; Secondly, by learning about the customers' processes and needs, service providers can get clear about the state of the customer's higher system elements; Thirdly, by interacting with customer and creating assets connection and social compleity service providers can also play a decisive role in terms of building up a "isolation mechanisms" to prevent firm from being replaced by competitors. Therefore, Posselt & Roth call for attention to the important roles of frontline service providers in terms of their distinct capabilities in relation with sensing and capturing information, knowledge and business opportunities. Furthermore, Posselt & Roth (2017, p.102) also point out that frontline service providers need possess technology-related as well as social skills, and be able to adjust behaviours and processes to highly volatile and subjective customer preferences.

In terms of approaches to develop firm competencies, Storey & Kahn (2010, p.397) find that firm enacting both codification strategy and personalization strategy to manage their new service development knowledge are able to generate a sustainable competitive advantage. Their research shows that knowledge codification strategy can enhance firm long-term potential by driving the proficiency of its new service development processes, whereas personalization strategy can create a positional advantage in terms of innovativeness. Most importantly, research findings suggest that a personalization strategy has a much stronger influence on innovation performance and on creating a sustainable competitive advantage than a codification strategy does (Storey & Kahn, 2010, p.405).

As Storey & Kahn (2010, p.398) have discovered that person-to-person interactions and personal relationships are essential for learning and knowledge transfer in organizations. Personalization strategy may involve both formal mechanisms for example project meetings and corporate away days, and informal mechanisms for example unscheduled meetings and coffee break conversations. It's believed that a personalization strategy will lead to the sharing of tacit knowledge which is hard to articulate, acquire, and store within individuals without direct personal experience (Szulanski 1996, p.28). Through this person-to-person socialization new service development staffs can share mental models, unify cross-functional understanding, and combine individuals' knowledge in new and different ways to give shared meaning (Nonaka & Toyama, 2003, p.3). Furthermore, it is reported that the sharing of tacit knowledge between the development team, customer contact staff, and customers themselves via a personalization knowledge strategy will play a crucial role in delivering the final service, and directly contribute to sustainable competitive advantage (Storey & Kahn, 2010, p.405).

In sum, while emphasizing on top manager's strategic roles in servitization researchers have also noticed frontline service providers' ever bigger importance. The interaction between frontline service providers and customer facilitate in-depth knowledge learning and opportunity sensing, eventually underpinning organizational dynamic capabilities in

servitization. Service providers are suggested to develop technology-related and social skills simultaneously, and to adjust behaviours and processes flexibly according to volatile and subjective customer preferences. Additionally, it is also recommended to employ knowledge codification strategy and, most importantly, knowledge personalization strategy to manage service innovation. However, although frontline service providers' importance in competence building and leveraging has been highlighted organizational dynamic capabilities are still believed to be resided in top managers. In the contrast, how frontline service providers' individual dynamic capabilities influence servitization performance has not been sufficiently studied. Therefore, researches aiming to address how frontline service providers interpret captured information and knowledge, sense future business opportunities, leverage individual and organizational resources, seize opportunities, transform existing capabilities, and finally change organizational performance become valuable.

2.3 Insights from project-based organization researches

2.3.1 Roles of project manager and team members in traditional project-based organizations

In project-based organization project manager acts as the centre of project networking, controlling and manipulating internal and external communication and information flow. The project manager is the single most important employee in every project and can have a significant impact on the success or failure of the project (Arto et al., 2015, p.79). Likewise, Parkin depict that important decisions constitute the very essence of the project manager's work life (Parkin, 1996, p. 261-262). Pemsel et al. also emphasize the salient importance of project managers in terms of knowledge creation, sharing and protection both inside and cross firm boundaries (Pemsel et al., 2016, p.656).

It is believed that, in project-based organization, prominent project manager can strategically affect firm performance with their distinct skills or capabilities. Because most of projects have significant geographical and administration distance from firm parent firms, the project manager usually acts as the single most important decision-maker in every project team. Eventually, the dynamic capabilities of project team will reside in the project manager and the project manager's distinct actions and skills will become the micro-foundations team dynamic capabilities.

While project manager is traditionally perceived as strategic decision-maker the importance of frontline project team members is underestimated or neglected. Team members are usually depicted as executors in different functional groups and their contribution is limited within operational excellence. Different opinions are for example from Sanchez and Heene, who claim that all individuals within a firm allocate resources to a certain extent and are thus considered decision makers for specific level of goal achievement (Sanchez & Heene, 1996, cited in Posselt & Roth, 2017, p.89). Moreover, the importance of ordinary team members has been reinforced in recent years along with the emerging of technology-intensive or knowledge-intensive projects. For example, Polyaninova (2011, p.5-6) points out that the continuity of organizational competence relies on every project member passing on knowledge and skills from completed projects

to ongoing or future projects. Because projects are becoming increasingly complex every project-based firm will face challenges to acquire and assimilate knowledge residing in both individual and organizational memories (Polyaninova, 2011, p.5-6). In this context, team members who are able and willing to learn lessons from past project, share insights with colleagues, codify and document such knowledge for future projects will become competence depositories critical for project-based organization.

Posselt & Roth (2017, p.94) propose that frontline team members in project-based solution business can significantly contribute to firm strategic decision-making. The rationale lies in that frontline employees' in-depth knowledge which are gained through customer interactions can facilitate the cognitive flexibility of project manager to imagine alternative strategic choices. Specifically, the manager's ability to perceive and identify which customer to serve and what resource to allocate depends on the ability of frontline team member to understand the customer's processes and activities and to identify latent customer needs (Posselt & Roth, 2017, p.102). Therefore, frontline team members also play critical roles in the development of organizational capabilities and sustaining long-term competitiveness.

In sum, while the strategic importance of project manager is indisputable, the frontline team members are playing more and more critical roles in relation with firm sustainable competitiveness. In addition to operational tasks, in technology-intensive or knowledge-intensive projects team members are increasingly involved in managers' strategic decision activities which forms the micro-foundations of organizational dynamic capabilities. However, whether frontline team members' individual dynamic capabilities directly influence team performance is in lack of studying and explanation.

2.3.2 Mechanisms to develop capabilities in project-based organizations

It is well known that project-based firms are built on temporary decentralization, autonomous organizational units, and fluid organizational structures (Söderlund & Tell, 2011a, p.208-214), and the challenges associated with knowledge governance in project business are especially pertinent. Researchers have extensively studied the knowledge creation, mobilizing, integration and leveraging along with the entire project life cycles including project design, commissioning and operations phases.

In order to categorize different type of knowledge in projects, Conroy & Soltan (1998, p.365) identified three "knowledge bases" in project implementation: an organization knowledge base, which includes the knowledge specific to organizations and environments in which the projects are implemented; a project-management knowledge base, which includes the knowledge about the theory and application of project management; and a project-specific knowledge base, which includes specific knowledge acquired within the implementation of a particular project. The knowledges generated in project can also be categorized into three groups: technical knowledge, project management knowledge and project-related knowledge, and in turn the newly created knowledge will enrich existing knowledge bases respectively. Similarly, Söderlund (2005, p.457) suggest that the project-based firms should primarily possess three different

strategic organizational competences: (1) business competence, (2) project competence and (3) technological competence (Söderlund, 2005, p.457).

After an empirical study focusing on Swedish technology-based engineering firms, he further proposes a model (Figure 2) illustrating four building blocks of project competence, namely project generation, project organizing, project leadership and project teamwork. Every building block consists of specific domain of knowledge. Firstly, the domain of project generation is considered the most important one in relation with getting the best projects, including for example to analyze and manage risks, to manage business cases and building networks. Secondly, project organizing domain concerns building good organizational structure and process for carrying out projects. Although most of firms have standard project structure but competencies to modify for example changing the meeting structures or the checkpoints and forums for every project is very important.

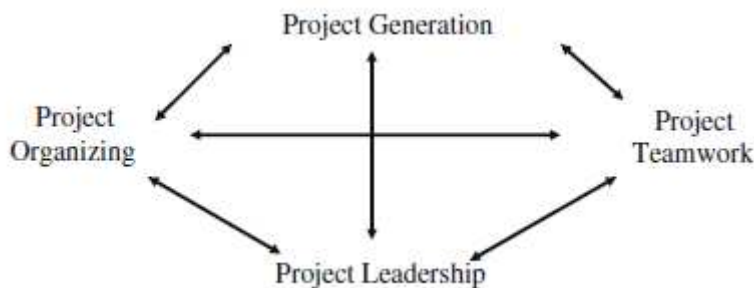


Figure 2: The architecture of project competence (Söderlund, 2009, p.109)

Then, project leadership is more about project manager's capability in project operation, but this capability may be much more collective with firm or divisional management team. Finally, the project teamwork competencies are stressed by both researchers and practitioners. Because teamwork in project may take place in various features for example cross-functional teams, cross-departmental teams, co-located teams or dispersed teams, firm usually need spend much effort to develop and expand the teamwork competence of individual engineers and other team members (Söderlund, 2005, p. 464-466). Söderlund stress that firm must produce a dynamic fit between the building blocks of project competence because every project is subject to frequent changes, both internally and externally. Furthermore, a change in one building block might have severe consequences on one or more of the other building blocks.

Based on a longitudinal study on the practice of complex turnkey-project management, Söderlund, (2009, p.110) summarises the most relevant competencies for every phase. First and foremost, project generation depends on the consulting competence which can help customer to specify contractual terms. Then, in terms of project organizing the competencies of matrix organization, in-house capabilities, increased focus on integration are most valued. Additionally, the leadership competence relies on project manager's senior management qualification. Furthermore, although engineers from supplier will solve most of the technological problems, teamwork competence must look upon the increased focus on cross functional teams for example the collaboration between sales, manufacturing and engineering teams.

As for knowledge base required for competencies development, Sivula (1997, p.132) claims that firm could source from both external and internal. On the one hand,

knowledge base of a firm can be influenced by external sources in at least two ways: cooperative development of knowledge in alliances and the absorption of knowledge from a client. On the other hand, the internal development of the knowledge base can be achieved through training employees, conducting R&D, or horizontal knowledge integration (Sivula, 1997, p.126). Particularly, Sivula (1997, p.126) points out that the absorption of knowledge will take place simultaneously with the formal trading of knowledge with customer because the employees of both firms intermingle in service delivery. Since the production and consumption of the service are inseparable (Vargo & Lusch, 2004, p.11) firms providing service need continuously exchange knowledge with customer and learn from interaction.

Furthermore, in terms of the scopes to organize knowledge management in project business, Ajmal and Koskinen (2008, p.12) point out that promoting knowledge transfer in project-based organizations should take place simultaneously in three levels, i.e. individuals, groups and organizations. According to Ajmal and Koskinen (2008, p.12), the biggest challenge which knowledge transfer face with is not technical challenge but cultural one. Liinamaa & Wikström suggest that project companies delivering solutions to their customers should focus on developing both technical and social capabilities for integration of knowledge and information and to ensure their competitiveness (Liinamaa & Wikström, 2009, p.331). Likewise, Posselt & Roth (2017, p.102) claim that servitization implies employees need possess technology related as well as social skills and adjust behaviors and processes to highly volatile and subjective customer preferences.

Last but not least, the importance of project team passing on competencies from completed projects to ongoing or future projects has also caught researchers' attention because of its relationship with firm long-term performance and sustainable competitiveness. Because of the increasing complexity of projects project manager and team members are facing ever greater challenge to acquire and assimilate knowledge residing in both individual and organizational memories (Polyaninova, 2011, p.5-6). Although the knowledge and experiences from earlier projects as a whole is crucial resource it is dispersed in organizational or individual depositories. The synergies among employees can only be possible if all employees are willing to honestly analyse failures and mistakes, and to openly exchange and share such knowledge.

To draw a brief summary for this subsection, the management of project-based firm entail particular challenges in knowledge management and competence development. First, the success of project operation depends on business competence, project competence and technical competence (Söderlund, 2005, p. 457). Second, project team need to develop knowledge in relation with four domains: project generation, project organizing, project leadership and project teamwork. Third, required knowledge could be sourced from internally and externally, and competence development need to be emphasized on three levels, i.e. individual, functional group, and organization level. Furthermore, individuals in project team should strengthen both technical and commercial capabilities. Finally, project team need encourage team members to learn from failure or mistakes, exchange and share knowledge, develop and pass on competence to future projects, and protect knowledge assets from dilution or loss.

2.4. Synthesize extant theories and raise propositions

Synthesizing aforementioned research findings, it is well acknowledged that service is a series of activities or processes which is to certain extent produced and consumed simultaneously and with the participation of customers (Grönroos, 1988, p.10), or in other words “service introduction and its delivery are closely intertwined (Gallouj & Weinstein, 1997, p.14)”. Therefore, when implementing servitization strategy, particularly taking the integrated solution as example, firms will operate with characters unprecedented for traditional product-oriented business.

First of the most, the main contents of the deliverables of servitization, i.e. services, are created during interaction between the service providers and customer. Service providers, who equipped with bundles of firm specific knowledge and products (appliance embodied with knowledge) (Vargo & Lusch, 2004, p.9), represent the firm and perform service creation and service delivery to contracted customer. Service providers together with cocreators on customer side are the co-producers of these services and the co-creators of value. Consequently, servitization performance relies on the specific competencies of service providers and their co-creators. Meanwhile, the project manager of integrated solution acts as the key role of coordination, configuration and decision-making of project. Therefore, the project manager and service providers both are key service providers and their service-specific capabilities will fundamentally influence the performance of integrated solution.

Secondly, different from traditional product-oriented business where batch of standard products can be designed and produced in distant factory, and person who responsible for delivery only need to do “deliver”, service providers in servitized firms need be multitasking and responsible for intensive decision-makings. Service providers need extensively communicate with customer, internal and external collaborators to learn about, assess, share and deliver necessary information and knowledge. During these processes they need constantly evaluate internal and external situation, make choice to allocate resources and figure out the best plan to deal with future challenges. Therefore, service providers are not only to certain extent decision makers (Sanchez & Heene 1996, p.19), the competences which they rely on to create and deliver suitable service is dynamic in nature (Sanchez 2004, p.521).

Thirdly, service providers are frontline employees dedicated for service provision and they include various functional roles including but not limited with project coordinators, system designer, service engineers, logistics coordinator. All service providers directly meet, communicate and interact with customer’s employee and the interactions collectively are crucial for servitized firm not only to execute project successfully but also to capture opportunities for future businesses. Therefore, to secure a desired outcome of servitization strategy firm need to employ certain mechanisms to develop individual capabilities including ordinary capabilities and dynamic capabilities.

Teece (2012, p.1400) suggest that, through in-depth qualitative research, there are opportunities abound to dig deeper into the linkages between individual or small-group managerial actions, dynamic capabilities, and long-run firm performance. Looking forward, Rabetino et al. advise to extend the dynamic capabilities approach to add clarity about the micro-foundations (Abell et al., 2008, p.489-502) of different servitization strategies (Rabetino et al., 2017, p.155). Echoing to their call, in following subsections I

will explain three objects intended to study: the fundamental influence of individual capabilities to business performance of project-based integrated solution, the strategic roles of project manager and service providers, and the mechanisms could be leveraged to develop servitization specific capabilities.

2.4.1 Roles of service providers in project-based integrated solution

Extant strategic management literature overwhelmingly studies the roles of CEO and the members of top management team (TMT), and emphasizes on their strategic influence on firm competitive advantage. However, the results drawn from traditional researches can barely be applied in servitization for example integrated solution business. Because of the idiosyncratic of service provision and the distinct operation form, the provision of integrated solution faces challenges fundamentally different from what the provision of traditional physical products will have.

The first challenge firm need to deal with in relation with integrated solution is the decentralized business operation. In fast-paced environment decentralized subunits must have considerable autonomy (to make decisions rapidly) but remain connected for activities that need to be coordinated. Likewise, Simon (2002) called this change as ‘near decomposability’ and implementing it is an important micro-foundation of dynamic capabilities. It’s believed that, with decentralized decision making, managers can observe relevant information and make decisions quickly. Without the communication to a single central decision-maker, there is also no comprehensive ‘rollup’ of information. Studies show that decentralization along product or market lines with independent profit centres will foster improved performance in many industries, at least during the period in which these organizational innovations were diffusing (Teece, 2007, p.1339). Because of the trends of decentralization, the operation of project team enjoys great autonomy and the project manager become the single most important employee in project team of integrated solution (Artto et al., 2015, p.79).

In this thesis I differentiate project manager from other frontline service providers in occasions when I need to highlight the decisive role of project manager. In project-based integrated solution, although project manager and frontline team members have different focuses, they both act as key players of service provision so that they are all service providers in nature. On the one hand, while acting as unreplaceable decision-maker the project manager should also undertake various operational tasks for example communication, coordination and operation management. On the other hand, while undertaking functional tasks at delivery site each service provider needs constantly evaluate customer’s activities, identify latent customer needs and figure out best plan for next step, so that service providers’ activities involve great extent of decision-making on the daily base. Therefore, both project manager and service providers need possess to certain amount of ordinary capabilities and dynamic capabilities. This assertion can partially be proved by what Lovelock & Wirtz (2004, p.280) claimed that, in service industry, frontline employees are a key input for delivering service excellence and competitive advantage. While project manager undoubtedly contributes to the main part of team dynamic capabilities with individual managerial skills and actions, service providers are expected to undertake more ordinary capabilities. Nevertheless, the

individual dynamic capabilities of service providers can also enormously affect the business performance of every solution project.

Because firm need dynamic capabilities to sustain competitiveness in rapid changing and complex market environment, so that project manager's learning and developing dynamic capabilities is critical for long-term success of integrated solution. Meanwhile, service providers not only contribute to project manager's development of dynamic capabilities (Posselt & Roth, 2017, p. 84) but also need individual dynamic capabilities for allocation of resources and for decision-making (Sanchez & Heene 1996, cited in Posselt & Roth, 2017, p.89). While ordinary competencies mostly rely on organizational routines and derived from organizational knowledge, dynamic capabilities mainly rest on entrepreneurial managers' shoulder and is built upon distinct knowledge and skills (Teece, 2012, p.1396). Organisational knowledge refers to organisation-specific and collective intelligence which are accumulated through formal systems and people's shared experience. In the contrast, individual knowledge is context-related and personal possessed skills, know-how and expertise. To improve business performance and sustain competitive advantage for project-based integrated solution, both project manager and frontline service providers need emphasize developing individual capabilities.

Furthermore, according to service-dominant logic (SDL) the pattern of firm-customer interaction has been changed. Customer becomes more and more embedded in the service offering and ultimately is also responsible for the value added to the process (Vargo & Lusch,2004). Consequently, customers always are co-producers of services and co-creators of value, not simple marketing targets, because they mobilize knowledge and other resources in the service process that affect the success of a value proposition (Ordanini & Pasini, 2008, p.289). Therefore, it is important to point out that the co-creators of service providers, who participate the co-creation of service deliverables on customer side may also contribute to competitiveness of integrated solution with their own individual competencies.

To draw a brief summary, frontline service providers, the project manager and team members, will not only contribute to operation excellence with their ordinary capabilities but also contribute to firm sustainable competitiveness with their individual dynamic capabilities. In addition, decentralized organizational structure is beneficial for integrated solution to gain improved business performance. Moreover, to cope with challenges derived from rapid changing environment and fluid organizational structure both project manager and frontline service providers should constantly renew service-oriented capabilities. While project manager is more influential in team dynamic capabilities development, service providers' contribution mainly focuses on ordinary capabilities. Finally, the co-creators of service providers may also contribute to competitiveness of integrated solution with their own individual competencies.

Based on theoretical foundations discussed in this section and corresponding to the first research question, I make the first proposition as below:

Proposition 1: Frontline service providers play strategic roles in project-based integrated solution.

2.4.2 Influence of service providers upon organizational dynamic capabilities

As we have realized that in traditional strategic management researches most of attention has been put on the causal relationship between firm-level routines and firm business performance (macro-level mechanisms), but the influence of individuals (micro-level mechanisms), especially of those outside of top management team for example middle managers and ordinary employees, is significantly neglected.

Teece (2012, p.1396) notes that a routine is a repeated action sequence and it may root in the algorithms and heuristics about how things will get done in specific firm. Organizational routines including those related to organizational transformation will transcend the individuals involved but are also believed being developed and embedded in the minds of multiple employees (Teece, 2012, p.1396). Teece's statement uncover the linkage between organizational routines and individuals. Therefore, organizational routines can be understood as being produced aggregately by individual intentional actions and being shaped by individual traits.

In this thesis I will further borrow Routine-Performance relationship model (Abell et al., 2008, p.495) as theoretical foundation to analyse how the individual-level factors, distinct skills and capabilities, can affect firm-level outcomes.

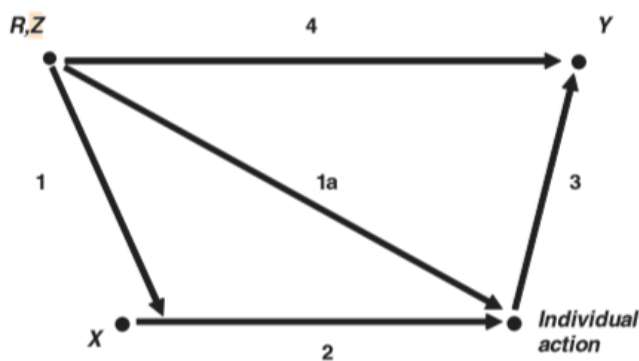


Figure 3: Model of Routine-Performance relationship (Abell et al., 2008. Developed from the general model of social science explanation made by James Coleman, 1990).

In figure 1, Z and R refer to variables of firm-level routines and capabilities, X refers to individual skill with certain motivation, and Y represents firm-level outcome or performance. The functional process is: first, firm-level variables R & Z can impact/moderate individual skill by arrow 1, then individual motivated skill X lead to individual action by arrow 2, and finally individual actions will produce aggregate firm-level outcome Y by arrow 3. With this relationship model Abell et al. (2008, p.492) tend to emphasize that researchers should pay attention to how intentional human action and interaction can causally produce strategic phenomena. In sum, because firm-level outcomes or performance rely on collective individual skills and capabilities, distinct individual capabilities of key players will fundamentally influence the firm level capabilities and business performance.

It is notable that the capabilities in aforementioned relationship model should include both ordinary capabilities, which are perceived to enable firm to perform current activities

efficiently (Teece, 2012, p.1396), and dynamic capabilities, which are strategic and perceived to enable firm to maintain and extent competitive advantage (Teece, 2012, p. 1396). Teece calls to study the micro-foundations of dynamic capabilities. He clarifies that the micro-foundations of firm dynamic capabilities include the distinct individual skills, firm-level processes and procedures, organizational structures, decision rules, and disciplines; and, those micro-foundations undergird firm-level sensing, seizing, and reconfiguring capacities i.e. firm-level dynamic capabilities (Teece, 2007, p.1319). With Job's distinct influence in Apples' innovation performance Teece (2012, p.1397) highlights that the entrepreneurial manager's distinct (nonroutine) skills or capabilities constitute the micro-foundations of firm dynamic capabilities. Teece terms the individual manager's dynamic capabilities like what Job's has shown in Apples as managerial dynamic capabilities (2012, p.1400), and calls of digging deeper into the linkages between individual or small-group managerial actions, dynamic capabilities, and long run firm performance.

Interestingly, while Abell's relationship model disclose that firm-level capabilities, both dynamic capabilities and ordinary capabilities, are collective outcomes of individual factors, Teece's micro-foundation research could help us better understand the different building up mechanisms of firm-level dynamic capabilities and ordinary capabilities. As the differentiation Teece makes (2012, p.1397): Although some elements of dynamic capabilities may be embedded in the organization, the essence of dynamic capabilities for example evaluating and prescribing changes to the configuration of assets (both within and external to the organization) rests on the shoulders of top management; On the contrary, ordinary capabilities are perhaps rooted more firmly in organizational routines than are dynamic capabilities, and (ordinary) capabilities are built not just on individual skills but also on the collective learning derived from how employees have worked together, as well as on special equipment or facilities to which the firm has access (Teece, 2012, p.1396).

Furthermore, although all capabilities are based on knowledges, dynamic capabilities are believed to be particularly tied to real-time knowledge creation and general enough to avoid overly focusing managerial attention on the lessons of the past (Eisenhardt and Martin, 2000). Teece identifies the comprehensive portfolio of micro-foundations for dynamic capabilities including change routines and analytical methodologies (Teece, 2012, p.1397). He further points out that in order to sustain superior performance managers need to constantly revamp rules and procedures even in less volatile environment (Teece, 2012, p.1396-1397).

To summarise this subsection, firm level outcomes or capabilities rely on the collective effect of micro-foundations, i.e. individual routines, skills and capabilities. While entrepreneurial manager's individual dynamic capabilities constitute the majority of micro-foundations of organizational dynamic capabilities, organizational routines reside in employees are the main source of firm ordinary capabilities. Meanwhile, service co-creators will also influence project performance with their individual capabilities. Both dynamic capabilities and ordinary capabilities are based on respective knowledge base, but the individual dynamic capabilities are particularly connected with real-time creation of knowledge, especially knowledge creation in relation with change routines and analytical methodologies.

Last but not least, it is important to be aware that these micro-foundations of firm dynamic capabilities co-exist with other types of micro-foundations residing in TMT or specific functional groups. Other well recognized micro-foundations are for example managerial cognitive capabilities (Helfat & Peteraf, 2015, p.837) and transactive memory system (Argote & Ren, 2012, p.1379-1380). Micro-foundations of organizational dynamic capabilities residing in functional groups are for example what Eisenhardt and Martin (2000, cited in Teece 2007, p.1322) identified cross-functional R&D teams, new product development routines, quality control routines, technology transfer and/or knowledge transfer routines, and performance measurement systems (Teece, 2012, p.1397).

Based on theoretical foundations discussed in this section and corresponding to the second research question, I make the second proposition as below:

Proposition 2: The frontline service providers fundamentally influence organizational dynamic capabilities in project-based integrated solution.

2.4.3 Mechanisms to develop dynamic capabilities

Because the implementation of integrated solution is carried out with temporary decentralization, autonomous organizational units, and fluid organizational structures (Söderlund and Tell, 2011a, p.208-214) and because servitization implies higher degree of customization and customer interaction, project team is subject to greater external dynamics and thus have a greater need for organizational flexibility. Possessing higher level of dynamic capabilities is believed critical to sustain competitiveness. Söderlund (2005, p.457) suggest that the project-based firms should primarily possess three different strategic organizational competences, i.e. business competence, project competence and technological competence (Söderlund, 2005, p.457).

Söderlund, (2009, p.110) summarises the most relevant competencies: consulting competence for project generation; competencies of matrix organization, in-house capabilities, increased focus on integration for project organizing; leadership competence; and teamwork competence for collaboration among cross functional teams. Ajmal and Koskinen (2008, p.12) stress the biggest challenge during knowledge transfer is not technical challenge but cultural one. Liinamaa & Wikström (2009, p.331) suggest that project-based solution suppliers should focus on developing both technical and social capabilities to integrate knowledge and information and to ensure competitiveness. Likewise, Posselt & Roth (2017, p.102) claim that employees in servitization need possess technology related as well as social skills, to adjust behaviors and processes according to highly volatile and subjective customer preferences. In addition, Polyaninova (2011, p.5-6) suggests that knowledge and experiences from earlier projects are crucial resources so that team members should be able to learn lesson from failures or mistakes and share such knowledge with others. Moreover, Sivula claims that firm could develop competencies by capturing external knowledge in alliances or from clients, and internally through training, R&D, or horizontal knowledge integration (Sivula, 1997, p. 126).

Based on a case study of project-based solution business, Artto et al. discover eight integration mechanisms hopeful to enhance overall business performance. These eight mechanisms are: audits, creation of formal external relationship, provision of value-added services, creation of formal internal relationship, use of cross-unit resources, participation in system design, promotion of life cycle perspective, and selection of a project manager (Artto et al., 2015, p.76). Artto et al. claim that interaction and cooperation between project implementation and service activities over the life cycle could improve customer relationship management and ensure business continuity. Likewise, Rabetino et al. (2017, p.145) identify several key initiatives and practices linked to successful implementation of servitization strategy. They summarized three core themes of the servitization strategy at organizational-level, i.e. operational efficiency, customer management, and portfolio development. It is believed that in practice firms usually combined two of the three themes: operational excellence (e.g., competitive price, quality, reliability and availability), and customer intimacy (e.g., partnerships and easy to deal with).

To answer research questions, an empirical study will be conducted to testify mechanisms which are proposed by Rabetino et al. (2017, p.144-156) to develop organizational dynamic capabilities. These mechanisms are believed to enable project manager and all team members develop distinct capabilities and sustain long-term competitiveness of integrated solution. These mechanisms are:

- Capture prominent project managers
- Encourage internal move to cultivate multitalented service providers
- Hire service-oriented employees and train existing ones with commercial skills
- Acquire talents from competitors
- Map employees' skills & implement service-oriented trainings
- Create service-oriented motivation policies
- Utilize capability development technologies

To sum up briefly, to improve individual capabilities firms are suggested to rely on three bases: improving individual skills, developing collective learning derived from how employees have worked together, and building special equipment or facilities to which the firm has access (Teece, 2012, p.1396). The mechanisms planned to testify in empirical study are believed most relevant to service providers, the project manager and team members, to develop servitization specific dynamic capabilities.

Based on theoretical foundations discussed in this section and corresponding to the third research question, I make the third proposition as below:

Proposition 3: Firm can leverage various mechanisms to develop organizational dynamic capabilities in project-based integrated solution.

3. METHODOLOGY

In last chapter theoretical framework in relation with individual's influence on organizational dynamic capabilities in servitization, the roles which service providers play, and studied capabilities developing mechanisms are analysed. Correspondingly, three propositions are made aiming to answer research questions. The theoretical findings and these propositions will be tested in empirical study.

This chapter will introduce the methodological choices made for planned empirical study in later chapter. The adopted research philosophy comprises important assumptions that support the research strategy and methods chosen as part of that strategy (Saunders et al. 2019, p.128). First, the research philosophy will be indicated; Second, the approach of theory development is presented; Third, selected strategy and research methods are continued; Then, the process of choosing case company will be introduced; lately, the methods of data collection and analysis will be explained; Finally, the validity and reliability of the study will be discussed.

3.1 Research Philosophy

The term research philosophy refers to a system of beliefs and assumptions about the development of knowledge (Saunders et al., 2019, p.130). Before continuing empirical study I want to explain the philosophy which this thesis built upon. Although it is aiming to address specific problems in particular organisationa I am, nonetheless, developing new knowledge (Saunders et al., 2019, p.130).

The assumptions in relation with different research philosophies include (but are not limited to) assumptions about the realities a researcher encounters in his/her research (ontological assumptions), about human knowledge (epistemological assumptions), and about the extent and ways his/her own values influence the research process (axiological assumptions) (Saunders et al., 2019, p.130). These embedded assumptions inevitably influence the ways the researcher understand his/her research questions, the methods he/she uses to carry out study and the logic he/she interprets research findings. Therefore, before choosing research methods, a researcher needs first to think about his/her beliefs about the nature of the world around, what constitute acceptable and desirable knowledge, or the extent to which he/she believes it necessary to remain detached from his/her research data.

As definition by Saunders et al. (2019, p.135), ontological assumptions shape the way in which researchers see and study their research objects including organisations, management, individuals' working lives and organisational events and artefacts. It sets the foundation for researchers to understand of, for example, what the nature of reality is, what a solution project likes, and what it will like being in a project team. Meanwhile, epistemological assumption concerns about what constitutes acceptable, valid and legitimate knowledge, and how researchers can communicate knowledge to others.

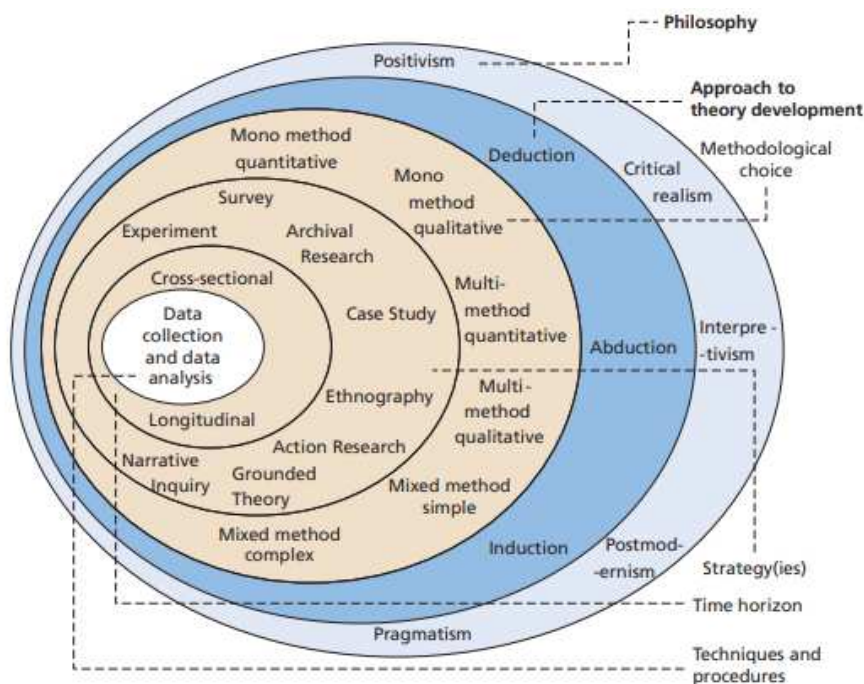


Figure 4: The research onion (Saunders et al., 2019).

As for axiology, it refers to the role of values and ethics, and axiological assumptions answer questions for example what the role of our values in research is, should we keep morally neutral when we do research, and how should we deal with the values of research respondents.

According to Saunders et al. (2019, p.144-151) five research philosophies widely adopted in business and management field are pragmatism, positivism, critical realism, interpretivism and post-modernism. Beside the theoretical consideration of ontological, epistemological and axiological assumptions the research focus in this study is to test the practical possibility to make a difference to organisational servitization practice, therefore the research philosophy adopted here leans towards the philosophy of pragmatism.

Positivists view the organization in question as physical object or natural phenomenon (the ontological assumption). In positivism research, only observable and measurable evidences are looked as meaningful. Researchers holding positivism belief always try to keep as neutral from data as possible in order to avoid the potential influence on research outcomes (Saunders et al., 2019, p.144-151).

In the contrast of positivists viewing the world from "what you see is what is"-perspective, critical realist emphasize explaining what we see and how we experience what we see. According to critical realists, the world is external and independent but not as accessible as a positivist would believe. Meanwhile, the reality and facts are a consequence of social construction agreed upon by people and there is no actual independent data and facts available for example to create statistical correlations. From axiological perspective, critical realist considers that the knowledge of reality is always someone's perception (Saunders et al., 2019, p.144-151).

Likewise, interpretivism is a philosophy created as a critique to positivism. From the ontological perspective, interpretivists believe that social constructions and organizations cannot be studied as natural science because humans create meanings. The responsibility

of researchers is to study these meanings. According to interpretivism, people have no universal law of truth because everyone can construct their own social realities from his/her own cultural background. Therefore, every interpretivist will try to create new, profound understanding and interpretations of the society and context. Researchers with this approach will collect data through narratives, stories and interpretations of people in different roles (Saunders et al., 2019, p.144-151).

Furthermore, postmodernism focuses on power relations and emphasizes the role of language, seeking to find the marginal views. Postmodernists totally reject the objective assumption of reality and see order of reality temporary and foundationless. From epistemological point of view, order can only be found by categorizing and classifying language. Because power relations cannot be avoided, the researcher needs to be very aware and open of his or her morals and ethical positions during the interview and writing processes (Saunders et al., 2019, p.144-151).

Finally, pragmatism asserts that concepts are only relevant where they support action (Kelemen & Rumens, 2008). Pragmatism considers theories, concepts, ideas, hypotheses and research findings not in an abstract form but as instruments of thought and action, and considers their practical consequences in specific contexts. Reality matters to pragmatists as practical effects of ideas, and knowledge is valued for enabling actions to be carried out successfully (Saunders et al., 2019, p.144-151).

The study planned in this thesis is aiming to resolve the controversy around the outcomes of servitization strategy and try to discover applicable mechanisms to improve competitiveness of service business. In other words, this study starts with a problem or, more specifically, starts with the deficiency of emphasis on individual capabilities, and aims to contribute practical solutions that inform future practice (Saunders et al., 2019, p. 151), so that it holds pragmatism belief in the first place. This study also stays consistent with what Elkjaer and Simpson (2011) highlighted attribute of pragmatism where the inquiry is initiated by doubt and a sense that something is wrong or out of place, and aiming to recreate the belief when targeted problem has been resolved. However, although I tend to emphasize the importance of individual capabilities towards firm level capabilities and the influence of individual traits towards firm business performance I still believe that organizations are true reality and management policies can be universally applied in similar organizations. Therefore, this study has strong tendency of positivism philosophy and the perspective I choose to study business and management issues in servitized firms is mostly lean towards 'objectivist'.

3.2 Approach to theory development

As illustrated on research onion (Figure 4), there are three approaches leading to development of theory: deductive approach, inductive approach and abductive approach. According to Saunders et al. (2019, p.153), if the research starts with existing theory, normally developed from literature reading and analysis, and the researcher designs a research strategy to test the theory, it is deductive approach; if the research starts by collecting data to explore a phenomenon and the researcher builds new theory (typically a conceptual framework), then it is inductive approach; while the research starts with collecting data to explore a phenomenon, to identify themes and to explain patterns, then

moves on to generating a new or modifying an existing theory, and ends in subsequently testing updated theory through additional data collection, it is abductive approach (Saunders et al., 2019, p.153).

In this thesis, the management challenge emerged in servitization implementation and the research gap which I desire to fill is to systematically analyze how dynamic capabilities are developed in servitized firm, or more specifically in integrated solution provision. This purpose encourages me, on the one hand, to conduct a comprehensive literature review aiming to find out the general theoretical framework addressing the strategic roles of frontline service providers, and then test these findings in empirical study; and on the other hand, to explore special characteristics of service provision and the distinct influence of co-creators from customer side upon project performance, seeking to gain enough evidence to characterize their roles. Therefore, the inquiry of both testing existing conclusion made by precedent researchers and enriching existing theory with theory exploration has led the research to a mixed approach (Saunders et al., 2019, p.157).

The theory framework of strategic management derived from traditional industry sets the foundation to understand potential strategic roles of project manager and team members in the project team of integrated solution but is in lack of systematic analysis and explicit elaboration. Meanwhile, project manager and ordinary team member undertake different tasks in project team, so that they may have strategic influence in different degrees. Therefore, an empirical study and correspondent deductive analysis are conducted to testify these possibilities.

Considering the idiosyncrasies of service co-creation and simultaneous production-consumption, the co-creators of service providers may also have to some extent influence on project performance. In extant strategy researches the influence of co-creators from customer side was rarely mentioned, thus relevant data collection and inductive analysis is meaningful for the exploration and enrichment of servitization research.

The theory development process in this thesis includes two steps: firstly, in order to fill the research gap and answer research questions, I extend the existing framework about entrepreneurial managers' strategic roles to include both project manager and frontline team members and create three propositions; secondly, I launch a multi-case study and collect evidences to test these propositions; and thirdly, data in relation with the influence of co-creators from customer side are collected and summarized, and the roles they could play are proposed.

In sum, I choose inductive-deductive mixed approach in this research. Additionally, in order to generate obvious results within limited data this study focuses on one unique type of servitization: project-based integrated solution, so that the key players of service provision are the project manager and frontline service providers in project team.

3.3 Research methods

There are two distinct but may co-exist methods for data collection and analysis, quantitative methods and qualitative methods. While quantitative methods require

standardization of terminology and operationalization of phenomena qualitative methods may be used to research the certain phenomena more in depth when the boundaries between the phenomena and context are not clearly evident (Patton 1990,p.13–14).

Although case study may include quantitative evidence in social science research case study typical adopt qualitative evidence. In this research, most of evidences expect to collect in interview are related with respondents' opinion and attitude, and the standardization of terminology and operationalization of phenomena are quite problematic. Therefore, qualitative methods are more suitable to adopt for data collection and analysis.

3.4 Research strategy

As 'research onion' (Saunders et al., 2019) suggests there are various research strategies to be selected in order to test a revised theory framework but in this thesis the most appropriate one in author's consideration should be case study. In business research, case studies are popular research methods and the rationale for choosing case study lie in two considerations. First, case study is suitable especially for investigating contemporary phenomena in depth within real-life contexts, and especially when these phenomena encompass important contextual condition (Yin, 2009, p.18), for example servitization in this research. Second, case study is an all-encompassing method. Some results may rely on multiple sources of evidence and data needing to converge in a triangulating fashion, and other results may benefit from the prior development of theoretical propositions to guide data collection and analysis (Yin, 2009, p.18). Moreover, in order to draw unbiased and more robust conclusions, researchers can examine multiple separate cases and triangulate evidence from different sources (Yin 2009, p.27).

Therefore, in empirical study I carry out multiple case study and collect data from semi-constructed interviews. Questions are designed to probe the actual roles project manager and service providers play in solution project, and the extent of autonomous and responsibility in terms of making decision in decentralized and temporary organizational structure. The premise is although firm remain most of organizational structure and management hierarchy as manufacturing company business are mainly undertook by dispersed project teams. Therefore, the interviews are processed to collect data in relation with modified theory framework and my propositions.

3.5 Choosing case companies

For manufacturers, commercializing the bundles of products-services is expected to generate fruitful outcomes and is believed enabling firms to escape from commoditized market, to differentiate from competitors and discourage newcomers, and to respond to new or expected changes in policy, legislation or fiscal measures. However, influenced by history of manufacturing business and constrained by limited resources, how to

develop servitization specific capabilities and improve business performance become salient challenges for firms newly embracing servitization strategy.

In this study the firms selected for interviews are servitised manufacturers in water treatment system industry in China. This decision is based on several considerations: First, project-based integrated solutions are prevalent offerings in water treatment industry; Second, many manufacturing firms in China water treatment industry start off servitization in recent years, which offers the opportunity to spot similar patterns in their reactions dealing with challenges derived from this transformation; Meanwhile, because China is emerging market and at the early stage of servitization there is possibility for me to conduct research with predecessors' research findings as guidelines.

All of them are family owned small and medium enterprises (SMEs) and were founded in the 1990s. These three firms are located in same city which is known for its cluster of Clean Industry. Benefited from the environment of industry clustering, firms having similar business can easily be setup and access resources from outside. It is reported that until 2015 there are more than 1500 companies in Clean Industry have been registered and most of them are SMEs. Most of those firms originated from Startups initiated by experienced salesperson or engineers in this industry. Within same cluster, firms may compete at one time and, at another time, they may cooperate with each other. For example, system suppliers sometimes have to buy parts from competitors because each of them is specialized in certain products. In other cases, firms have to cooperate for third-party service, for example painting treatment, or rare resource, for example personnel of project managers and patent owners.

Traditionally these three firms are manufacturers providing water treatment equipment and relevant products, and usually they are also responsible for on-site installation and system testing after delivery of products. Service after warranty period will be charged separately. In recent decades, more and more suppliers have increased service provision in their full-package offerings to improve competitiveness. Providing project-based integrated solution become the most popular business model and sometimes operation management will also be included in offerings.

	Firm S	Firm M	Firm C
History in industry	26	28	21
Manufacturing Base	No	Yes	Yes
Subsidiaries	4	7	0
Sales to Dealers	No	Yes	Yes
Exports	No	Yes	Yes
Number of own project managers	4	8	2

Table 1: Background information of interviewed firms

Company S: S was funded in early 1990s. Previously it had a manufacture base specializing in metal work and system engineering. At present, all production is outsourced but the invests in engineering department and sales department are increased. It has 4 wholly owned subsidiaries focusing on sales and after-sale service, and their business is mainly in China market.

Company M: M was also funded in early 1990s. It has full functional manufacture base and in recent years the invest in manufacturing has been reinforced. Part of its production output are sold to dealers or even competitors. It has 7 wholly owned subsidiaries focusing on water treatment industry. Currently it has also invested in financial service providing loans to customers. It is actively searching for business opportunities in foreign market especially in south-east Asia.

Company C: C was funded in later 1990s. It has a medium scale manufacturing base now but has no sales subsidiary. Before, most of its sales came from parts fabrication. It has dealers both focusing on domestic market and foreign market. In recent years it has increased sales volume made by own sales force. It is seeking dramatic business increase by reinforcing system design, direct sales and innovative service.

3.6 Data collection and analysis

Case study evidence may come from six sources: documents, archival records, interviews, direct observation, participant-observation and physical artefacts (Yin, 2009, p.98). According to Yin (2009, p.108) interviews are an essential source of case study evidence because most case studies are about human affairs or behavioural events. If researchers can find well-informed interviewees it will much easier to gain important insights into such affairs or events. Because interviewees usually possess stock of background information, sometimes, they can even provide shortcuts to the prior history of such situations, helping researcher to identify other relevant sources of evidence (Yin, 2009: p108), and get much profound understanding of the overall events.

The interviews carried out to collect empirical data can be structured, unstructured or semi-structured. According to Maylor & Blackmon (2005, p.230-231), in highly structured interviews the interviewees need to answer all closed questions prepared by interviewer in a structured manner, while in unstructured interviews the interviewees are asked open questions and usually need to discuss some topics. In unconstructed interviews interviewer may be open to emergent concepts and will include such information in the discussion during the interview. Comparing with aforementioned two types the semi-constructed interviews are both well-prepared and flexible so that are widely applied especially in social science studies. In a semi-structured interview, the interviewer will have prepared topics, themes, and questions to discuss. The interview will be guided by interviewer to follow designed course, but unplanned information or topics will also be interested if the interviewer feel those issues are valuable to answer the research questions. Because semi-structured interviews are quite unformal, to ensure that all planned topics are covered and demanded data are collected becomes challenging for interviewers. To have a productive semi-constructed interview, according to Yin

(2009, p.69), the interviewer needs to grasp firmly the issues being investigated and be a good listener capable of asking good questions and interpreting the answers.

Semi-structured interview can cover key issues which researchers are most interested in but also provide opportunities for interviewees to emphasize the topics or aspects which they feel important while researchers may have neglected. However, as Yin (2009, p.108-109) has reminded, when interviewees are required to explain behavioural events the response are usually subject to the common problem of bias, poor recall, and poor or inaccurate articulation. Therefore, corroborating interview data with information from other resources are reasonable approach.

The process of case study is described as below: First, semi-structured interviews were launched to collect data for this study. I design questions in three themes: what roles project manager and service providers play in project-based integrated solution; how individual capabilities of project manager and service providers affect business performance of integrated solution; and how learning and knowledge management mechanisms can be leveraged to improve firm capabilities. Interviewees including CEOs, project managers and service providers from three case companies were interviewed individually. In order to avoid bias as much as possible, not only interviewees at same positions were asked similar questions, opinions on key issues from interviewees at different positions were also retrieved. Other relevant topics or unpredictable insights were also welcomed by interviewer.

Then, data were analysed. According to Yin (2009, p.38) after collecting data, there are five specific techniques for analyzing case studies: pattern matching, explanation building, time series analysis, logic models, and cross-case synthesis. In this research, received data were coded, answers to same question were triangulated, similar patterns were identified, causal explanations were built, and eventually findings from every case were cross-case synthesized.

Finally, primary results were communicated with interviewees, their opinions to my data interpretation were collected, and correspondingly primary results were revised.

	Firm S	Firm M	Firm C
Interviewed Business Owner	30Min+50Min	25Min+35Min	50Min+75Min
Interviewed Project managers	25Min+50Min	35Min+65Min+40Min	35Min
Interviewed Team Members		45Min	25Min
Total Interview Time	155Min	245Min	185Min

Table 2: Time for interviews

In data collection phase, the interviews were conducted via Wechat calls, which is the most popular mobile phone based social media application in China. I first contacted three business owners and introduced the ideas of servitization and the purpose of this study. Then, I was recommended to their project manager and experienced team member. I originally planned to interview three person each from every company including business owner, project manager and team member, but ended in two interviewees from S and three interviewees each from M and C. Question lists were posted to each business owner after the first call and were asked to transfer to selected project manager and team member. During the first call to business owners and to project managers, the purpose of this study and main concepts were introduced, and some opinion questions were asked. More detailed questions were asked one week later but some questions might be repeated in order to get more precise information. I made note for every conversation, and those records were summarized and analyzed after interviews.

The primary results generated from data analysis were reported to three business owners. I have brief conversation with each of them, discussing my analysis results and asking their opinions. However, except some minor misunderstanding we didn't find any serious problem or disagreement in my results.

3.7 Validity and reliability of the study

When researchers embark a research the quality of a research needs to be considered in terms of the reliability of the research outcomes and the validity of the selected research method. According to Hirsjärvi et al. (2009, p.231-233), reliability refers to the possibility that the same results can be achieved if the study is repeated, and validity refers to the applicability of the selected research method to measure the targeted phenomena (Hirsjärvi et al., 2009, p.231-233). Yin (2009, p.40-41) also claim that a research design should represent a logical set of statements and readers should be able to judge the quality of given research according to certain logical tests.

Yin (2009, p.40) suggests using four common tests including construct validity, internal validity, external validity and reliability to verify the quality of research design and recommends tactics respectively. Specifically, to have external validity research designers are expected to define a domain to which the study's findings can be generalized; to have construct validity the data collectors are required to identify correct operational measures for the concepts being studied; and to have internal validity, usually for explanatory or causal researches answering 'how' or 'why' question, data analysts are demanded to establish causal relationships between the findings and studied phenomena. Furthermore, to have reliability data collection should demonstrate that all the operations can be repeated, and the study will finally have the same results (Yin, 2009, p.41).

To carry out a high-quality research, this thesis started with tactics aiming to increase external validity. In research design stage I planned a multi-case study focusing on servitized firms which were providing specifically project-based integrated solution. On the one hand, this approach made sure data can avoid bias and, on the other hand, it had the potential to be generalized for firms in similar situation. Then, in data collection stage I considered tactics to improve construct validity. Specifically, I used multiple sources

for every evidence, established chain for evidence and had key informants review the draft report of case study. Moreover, in data analysis stage I adopted series of tactics to achieve an ideal internal validity, i.e. to do pattern matching, to do explanation building around propositions, and to address rival explanation. Finally, to make sure the reliability of the upcoming study I tried to conduct the interview in neutral manner, documented answers as detail as possible, and used cross-analysis to capture informants' real meaning as accurate as possible.

Overall, the validity and reliability of this research were undergirded by well-planned, neutral and transparent processes, and the draft case study report was reviewed by key informants.

3.8 Ethical consideration

Researches should be carried out ethically. The ethical awareness of this study is particularly displayed during interview processes. The highlighted ethical factors in empirical study are for example protecting respondents' rights, informed consent, protecting personal privacy, and honest data collection.

To protect respondents' rights means the data collection should not entail any harms in the form of embarrassment, abuse, stress, pain or conflict (Saunders et al., 2012), and the interview should be organized for respondents' best interests. For example, the appointed interview time take interviewees' convenience into consideration and no delay or prolonging would take place. Meanwhile, recorded information would be well protected and potential conflict between interviewees would be avoided.

Informed consent required the participants to be aware of what were expected of them and any information would be expressed with consensus. In this study, interview questionnaires were sent to interviewees beforehand and my intention were clearly informed in order to avoid unpredicted embarrassment. If one interviewee hesitated to express his/her opinion on certain questions he/she could keep silence for that one.

Protecting personal privacy is important for the researchers to ensure that the participants will be protected from leakage of their identities. It is particularly critical when data and findings will be reported (Saunders et al., 2012). In this study the interviewees were kept anonymous when data were summarized, analysed and reported. Any information from one interviewee would be protected from leaked to another one.

Finally, honest data collection is critical process to ensure the overall accuracy, transparency, objectivity in the research process. It's popularly recognized that researchers should keep honest and truthful in the collection of the data, in the analysis and reporting of the findings (Saunders et al., 2012). In other words, interviewees should not be misled or deceived to provide information for the benefit of the researcher. In this study, interviewees were aware of what questions would be asked and what purpose the study was for. Privacy protection was promised, and honest opinion and facts were extremely emphasized. In order to avoid misunderstanding and misexpression opinion collection were conducted one week after the release of question list.

4. EMPIRICAL FINDINGS

4.1 Introduction of the projects and the competition

Project background: The most popular contracting forms in industrial water treatment market in China are BOT (Building, operation and transfer) project, EPC (engineering, procurement and construction) project, and Turnkey project.

BOT projects usually are government granted civil projects, for example a wastewater treatment plant, including financing, building, and an operation period as long as 30 years. BOT projects normally need large scale investment which contractors have to seek loans from banks and pay back later with profit made from commercial operation of completed wastewater treatment plant. EPC is preferred by customers whose projects contain complex engineering or proprietary technologies and the customer wants a solo contractor responsible for all the risks in engineering, procurement and construction of such facility. EPC projects usually have small to medium scales and are commonly adopted by firms in this study. Beside BOT and EPC, the rest of projects are just required to end in Turnkey status, i.e. ready to use. Turnkey projects are typically conducted to design, produce or outsource, and install single equipment, usually without civil construction.

Overall, BOT or EPC projects normally involve huge amount of cash flow and numerous inter-firms coordination, creating critical challenges to contractors' managerial capabilities for example, but not limited by, financing, planning, building, operation, outsourcing, coordination, etc. To be qualified for BOT or EPC contractor, firm need to apply for certificates from government authorities, and to maintain these certificates firm need to be verified every certain period of time. Although applying and possessing such certificates are not easy in terms of criteria of financial performance and business scale, firms are eager to pursue these certificates because these certificates are thresholds to participate in competition for big contracts. My interviews show the most popular projects which interviewed firms are involved is EPC projects.

The process of water treatment Project: A typical integrated water treatment project includes six sequential phases, i.e. initiation, definition, design, development, implementation and follow-up. Phases from initiation till design usually are undertaken by marketing and design department. Phases from development till follow-up usually are carried out by project team at delivery site. Customer will invite suppliers to a bidding after accepting the final design. Supplier who wins the contract will start off from crafting detail schedule, outsourcing and ordering equipment, recruiting team members, and preparing tools for the upcoming implementation phase. In recent years, not only the form of projects but also the rules of competition are standardized in water treatment business. As the owner of M has noted:

'The bidding processes of many projects are now organized by professional procurement service companies and the members of bidding committee are all industry experts. The market is unprecedentedly more transparent than before. Comparing with fixed criteria like technology advancement and price, sales and marketing efforts can help very little to win contracts.' (Owner of M)

Not only the market has become mature, the development of information technology has enabled customer to access information more efficiently.

'Customers will ask what similar projects we have completed and usually they will send experts to visit our reference projects and talk with other users. Customers can also use "peer-recommendation" because they usually are members of same industry association and they can exchange information about suppliers with each other.' (Owner of M)

The overall impression is that customers are becoming more and more familiar with main suppliers or, if they do not want to take the risk, they may invite professional procurement agency to handle the bidding processes, so that competitions are now taking place in a transparent environment. For solution suppliers, the focus of consideration is not advertisement or marketing but trade-off between investing in technologies/products or investing in services.

'Big companies can use their capital to recruit talents mastering new technology, taking over leading industry position quickly. Customers also prefer to do business with leading companies and sometimes their price can be 30% higher than the lowest. For small companies like us the only chance to win contract is providing more customized service.' (Owner of C)

While big firms are pulled to capture more comprehensive technologies to keep superior positions, small firms have to focus on more flexible approaches for example high quality service. Furthermore, competition has pushed resources to flow and deposit in few leading firms, leaving most of small companies vulnerable. Small firms have to concentrate on affordable resources for example talents who can lead service-oriented business.

'The market, I mean the market we can access, is shrinking sharply in last several years. Customers now tend to do business with big companies, which have certificate and experience to run ETC project as principal contractor. In addition, banks also like to provide project financing to big companies. I am afraid companies like us will have less and less scalable project in the future.' (Owner of S)

Therefore, the differences between leading firms and others will become bigger and bigger and finally competition may end in "winner take all", just as people have noticed in aftermarket where the rules of competition were rewritten by leading firms.

'The aftermarket is also becoming more difficult for us to access because big companies have been promoting modularized products for years. We have neither quality advantage nor price advantage if customers want to switch to modularized products.' (Owner of S)

To sum up, market has become mature and competition has become much more transparent than before. As a result, the competition is taking place around higher level of qualification, technology, quality and service, leaving traditional price-competition irrelevant. Mature market also drives products and procurement service to become standardized and encourage capital to crowd into leading firms. Facing changing market, firms have to take all these factors into consideration when planning future business model. Interview results show that technology and product development are interpreted as capital-intensive investment and, on the other hand, increasing service capabilities is looked as affordable invest by small and medium enterprises (SMEs).

However, later interviews remind me that top managers' decision-making are not only based on traditional resources for example finance and physical assets but are significantly influenced by decision-makers' interpretation of firm learning capabilities,

i.e. the capabilities to master service business which is critical for future survive and success in this industry.

4.2 Different strategic choices and the underneath concerns

Increased customer expectation has pulled suppliers to provide integrated solution with full range of service in water treatment industry. Firms not capable of providing bundles of high-quality product-service packages will find themselves left in unfavoured situation. Additionally, firms may also have realized that providing service is not as simple as “adding something extra”, possessing relevant capabilities is expensive and time-consuming. What’s worse, leading firms may become stronger and stronger and firms falling behind may become weaker and weaker because resources such as talents and financial capitals are willing to follow winners.

Facing changed customer expectation that emphasizing on bigger proportion of services. The information I have collected show that CEOs and frontline project managers or project team members have different feelings and consequently have different reactions. Frontline project managers and project team members usually are strongly impressed by the service-demanding trends for example one project manager told:

‘Customers nowadays will not feel surprise and thankful for our visiting them in remote construction site and showing up our brochures because they can easily get information and reach suppliers on internet. Customers simply want to know what we can do better than other suppliers. Therefore, we must know customer’s problem better than competitors and sometimes even better than customer themselves.’ (Project Manager of M)

The frontline employees usually have direct feeling about customer’s expectation so that they are more likely to adapt to customers’ requirement and try to satisfy them with better services. Differently, some interviewees may see market change from different perspective and come up with different solution to cope with this change. For example, The Owner of M extremely emphasizes on traditional solution, pointing out that firm should invest more in firm resources such as breakthrough technologies or products.

‘Service? It’s difficult to measure and price! Instead of service, we must put more emphasis on new technology or new products. We are looking for opportunities to cooperate with companies from Europe, USA or Japan. We need to combine existing sales network with advanced technologies or new products because we cannot expect old technologies or old products to generate as much profit as before.’ (Owner of M)

Comparing information provided by the owner and his project manager, I think the tendency of firms turning to technology and products can be explained at least from two aspects. The first explanation is that some firms are more familiar with the traditional manufacturing business style and have not figure out what kind of services are wanted by customers and how to price them. The second explanation is the technologies for water treatment processes have maintained unchanged for many years, so that products from almost all suppliers are technically similar. In other words, existing products are commoditized, thus firms without technology breakthrough will face competition all around price. It is easy to understand that some CEOs tend to lose confidence in their existing products and turn to invest in high technology tooling machines and try to

produce better products. However, it may also reveal a fact that some firms are in lack of capabilities or at least not ready to deliver integrated solution. Therefore, they have to continue investing in technologies or products even such invests are not promising.

'Providing good services for example helping customer to identify hidden problem or teaching customers to be skilful operators need special knowledge and skills which most of our employees currently are in lack of. Back to years ago, I even couldn't imagine our company should do like this. To be honest, I even cannot find a handbook to tell me what exactly such service should include.' (Owner of S)

However, interviews also show that, with limited invest and within foreseeable term, making technology or product breakthrough is difficult. Meanwhile, it is also impossible to buy technology or product innovation from open market. Just as what VRIO framework has shown, technologies and product development capabilities are traditionally seen as rare resources for firms to sustain competitive advantage. Eventually, firms may have to choose conservative business development approach, for example focusing on business continuity with old customers, to deal with shrinking market.

On the contrary, I have also heard some optimistic response with regard the same questions. The owner of Company C noted:

'We have launched new strategy focusing on service at the end of last year. The system we are now marketing includes not only mechanical equipment but also complex electrical and control system. We have provided relevant service for long time but only recently found that we should reinforce these advantages. Therefore, we are planning to openly promote this idea to every employee because we hope all employees can devote to this transformation.' (Owner of C)

'The Environment Protection Bureau has installed monitoring devices at every drainage exit and, similarly, customer want us to provide uninterruptable service. We have seen opportunities in providing full range of service for customers.' (Owner of C)

It indicates that visionary entrepreneur can embrace the idea of providing better service and formulated a service-oriented business strategy. However, firms employing this strategy need quite long time to accumulate relevant experience and knowledge critical for steering this transformation. Typically, there are challenges in relation with employees' service-oriented capabilities.

First and foremost, getting every employee involved is critical for successful implementation of servitization. While in manufacturing era production mostly means repetitive tasks and every product has measurable specification, service production is more about exploiting everyone's own skills or knowledge (Vargo and Lusch, 2004: p2) and quality control is subject to individual changing situation. Therefore, it is challenging for servitized firm to maintain identical outcomes from all employees, and to satisfy customers with high quality service. Secondly, the transformation may need long-term incremental improvement. Because every employee has different learning capability, firm needs flexible training program allowing everyone to switch from product-oriented mindsets to service-oriented mindsets. Thirdly, firm also need to solve critical human resource shortage since frontline employees are a key input for delivering service excellence and competitive advantage (Lovelock & Wirtz 2004, p.280). Existing employees who cannot successfully adapt to new strategy may have to be laid off and new talents need to be trained or recruited. Beside cultivating qualified employees

through internal training, capturing talents prominent in project management or service business may become another competition firm has to face.

In sum, firms are facing hard choice in terms of being product-oriented or service-oriented in water treatment industry. Sticking to existing technologies and products means shrinking market but increasing invest, no matter in products or service, will entail big risks and uncertainty. However, firms seeking better market position must emphasize the qualification for future competition: firm level certification for principal contractors and individual level service-related capabilities. Interviews show the business owner of firm M has apparent history dependence so that interprets the market trends differently from his project manager. Firms with more knowledge deposit and long-term experience, such as C, may adopt service-oriented culture quickly and take leading places in competition. The business owner of firm S has less confidence with future potential due to lack of preparation when facing increasing service demand.

4.3 Roles of project manager and expected capabilities

The project manager plays the most important role in every project team and is responsible for the successful completion of project. Specifically, project manager must ensure the project proceed within the promised time frame and under the contracted budget, while achieving quality objectives. In this study answers related with project manager's duty or expected capabilities have been summarized into themes such as communication and coordination management, deliverables management, human resource management, changes and risks management, and project quality monitoring.

First and foremost, project manager should play in an intermediary role linking project team with internal and external stakeholders for information/knowledge exchange, resources allocation, task cooperation and etc. Internally, project manager needs to frequently communicate, coordinate with top management team and managers of relevant functional units; and externally, project manager needs to communicate, coordinate with customer, suppliers, government authorities and other stakeholders. Therefore, project manager acts as the most important leader, decision-maker, and the hub of information-flow in every project. Secondly, project manager should devote efforts to overall project management. The most important management duty include designing appropriate project management standards, developing a project plan, and managing deliverables according to the plan. Thirdly, project manager should lead and manage the project team. Specifically, he/she need recruit project team members, assign tasks to every team member, develop key performance indicators (KPIs), and conduct evaluation reviews to assess how well every task is progressed. Additionally, corresponding to the changing requirements and environment, every project manager must develop change control and configuration management processes. In order to manage risks, contingency plans are necessary to be prepared. Finally, project manager also need create follow-on plan for every key task to make sure that the whole project will not be delayed for any mishappen.

As for the importance or distinct influence the competent project manager could have, the interviewees' responses are overwhelmingly approved. Additionally, some interviewees also mentioned that old hierarchical decision-making has constrained project team's

performance in service provision. Quick response, swift decision making, pragmatic and insightful solution are essential factors to extend competitiveness in project-based integrated solution.

‘The project team is facing not only installation and test running but much more complex tasks. We need quick response and reaction to every on-site happening. Too much reports and negotiation can only lead to low efficiency, but customer want project to be “trouble-free.” (Project Manager of M)

Moreover, interviews show the early involvement of project expert is beneficial for winning project contracts because good proposal relies on precise identification of real problem and appropriate solution.

‘The project team, at least the project manager and project design team, should participate in early stage of project marketing because customers are not interested in general introduction but precise diagnose and insights to solve real problems. What customers most frequently ask is “which part you can do better than other suppliers?”. We need to tell customer exactly through which process and with how much budget we can solve problems.’ (Project Manager of M)

As a brief summary, study shows that project managers are not only responsible for communication and coordination but also need to play strategic roles in relation with on-site sensing and seizing opportunities and reconfiguring resource. Every project manager is seen as the single most important role in project team (Artto et al., 2015, p.79), who is critically in relation with performance of project team’s service provision. However, to maintain and extend competitive advantage in service-oriented competition firms may have to reconsider managerial structure inherited from previous manufacturing era. While project team seeking bigger autonomy in decision-making, which is typically emphasized by project manager in M, firms are also expecting project managers to possess sufficient managerial capabilities for leading project team.

4.4 Roles of project team members

It is recognized that firms seeking competitive advantage in integrated solution need service-oriented capabilities. However, more and more people have also realized that, to successfully carry out service business, firms transformed from traditional manufacturing industry need to rebuild organizational capabilities. In traditional product-oriented business, organizational capabilities are mostly resided in parent firm and services are looked as value-add activities. On the contrary, in service-oriented integrated solution business, services are main deliverables which can only be carried out by frontline service providers in project team.

As interviews show, service providers in project team usually can play multiple roles for example on team member said:

‘There are inappropriate equipment or treatment processes in customer’s factory. These problems may never be detected in original design but will appear along with changing work condition. Maintenance engineers with good business sense will identify such kind of

opportunities and promote either maintenance or replacement proposal to customer. Therefore, maintenance engineer can play roles of early stage sales, and their recommendations are appreciated by customers.’ (Team member from M)

Team members are popularly encouraged to search business opportunities, comparing with salesperson staying in headquarter, they have more direct interaction with customer employees and higher possibility to capture rare information.

The performance of integrated solution or the customer satisfaction in water treatment industry is to great extent depends on what capabilities every project team has. Therefore, recruiting qualified team members for every functional group and orchestrating their on-site cooperation become project manager’s primary responsibility.

Although interviewees agree that nowadays employees have much better education background and professional skills than their predecessors, managers are still concerned about employees’ competencies. It is recognized that employees working in service-oriented project teams are facing challenges totally different from working in previous manufacturing environment. For example, most of on-site tasks need cooperation with other functional group or co-creators from customer side. Flexible cross-function cooperation is essential for service development, service quality and customer satisfaction. Therefore, employees in project team are expected to have a blend of technical expertise and commercial insights. Moreover, Since the project team must keep the minimized organizational structure, hiring multitalented team members becomes necessary. One project manager ever recalled:

‘The cost to run a project may vary significantly. For example, every time when we have project in a new city the logistics coordinators with adequate experience and social networks can always have alternative solutions to handle urgent issues, saving time as well as operation cost.’ (Project Manager of C)

A project team usually is organized by team members with various professional backgrounds. Every team member works on one or more phases of the project and need to provide individual expertise, collaborate with other members and customers. Therefore, unstable organization and human resource will cause uncertainty of project performance.

‘One of the biggest challenges for me is how I can work as a conductor to orchestrate all team members, working on the same project and seeking a best result. Since most of team members only temporarily work here, it is hard to say to what extent I can influence them, so that most of the time they just follow their own experience.’ (Project Manager of S)

In sum, the performance of integrated solution relies on the collective capabilities of all team members. To successfully transform from product-oriented business to service-oriented business firm need emphasize developing team members’ ordinary capabilities and dynamic capabilities. The evidence shows that project manager from firm C has considered the influence of team members in details, it reflects that motivation policy in relation with project cost can encourage employees to pay more attention on capabilities development.

4.5 Influence of service providers upon team dynamic capabilities

As introduced before, the typical project team in integrated water treatment industry is led by a project manager and includes several functional groups. Team members are divided into groups such as commerce and marketing, solution design, procurement, electrics and controlling system, operation management, maintenance, documentation and information system. Beside team members residing at project site, there are also temporary employees responsible for installation, metal work and construction. To simplify our analysis, in this thesis I define employees in project team including project manager and all team members are service providers and differentiate project manager from other members only when emphasizing its decisive role is needed.

The importance of ordinary team members in project management is generally ignored or underestimated. In traditional project management literature, the values of team members to firm success are not more than functional tasks. As I have summarized in early chapters, project team and individuals in it, including project manager and team members, are traditionally looked as execution unit in firm hierarchy. However, during my study the influence of project team in terms of customer satisfaction and firm market position are frequently underlined by interviewees. It is consistent with notion made by Vargo and Lusch (2004, p.1) that, instead of focusing on exchange of goods in product-oriented economy, in service provision there is a revised logic focused on intangible resources, the cocreation of value, and relationships. Correspondingly, informants also emphasize the interconnection between team capabilities and the individual capabilities.

However, interviewees' attitudes to individual capabilities are likely to be bipolarly divided. On the one hand, there are still concerns about the capabilities of project teams because projects are usually located far away from firm head quarter and top management team. In other words, project teams are usually in lack of support from the parent firm, suppliers and networks. Therefore, some interviewees hold the belief that project teams should focus on execution installation and maintenance tasks. On the other hand, interviewees have noticed that project manager and team members could play more and more decisive roles in relation with providing service and capturing business opportunities. Overall, more and more people have realized that project teams working outside of parent firm but together with customers are not anymore less-important task-executers but extended limbs of parent firm. A vivid project team can operate as minimized subsidiary, providing full range of services and creating significant value for customers, and at the same time capturing future business opportunities.

In this study, I also ask interviewees opinion about the influence of customer's employees. The answers are unexpectedly similar. As one business owner noted:

'Most of problems in relation with water treatment system are caused by inappropriate control or modification of pumps, instruments or chemical substances in daily operation. Therefore, the quality reputation of our system is greatly related with customer employees' knowledge and skills. Training customer employees is one of key tasks project team need to strengthen.' (Owner of C)

Therefore, suppliers are quite aware that customer's employees are highly relevant with the reputation of integrated solution. Because of the extensive on-site customer involvement and the co-creation idiosyncratic of service provision, the attitude and capabilities of co-creators have significant influence on performance of integrated water treatment solution.

In sum, interviews have proved that frontline employees are a key input for delivering service excellence and competitive advantage (Lovelock & Wirtz 2004, p.280). Team level dynamic capabilities mainly reside in service providers including project manager and team members. In water treatment industry, service providers including project manager and team members are expected to carry out execution tasks as well as opportunity capturing tasks simultaneously. In project practice, in addition to technical, engineering and project management capabilities, managers need also develop commercial capabilities. Furthermore, managers should pay enough attention on interaction and co-creation with co-creators on customer side.

4.5.1 Customer-centric attitude and service development capabilities

The first discovery is that interviewees feel the meaning of service has become much wider than before, so that project team should be able to identify opportunities and develop services accordingly. When business was limited within selling equipment, service for suppliers just referred to logistics, installation and maintenance. Now, service must cover the whole process started from the first customer contact until operation management after delivering the project. For a normal integrated water treatment project service can include system design, proposal creation, solution exchange and modification, delivery, installation, document transfer, maintenance, training and following up. Because customers are expecting smooth solution implementation processes project team should have customer-centric attitude, identifying customer needs and providing expected services accordingly. As it is described by Project Manager from M:

'Customers nowadays think that water treatment equipment are mature products and should be "trouble-free", so that we need to consider all issues in addition to delivering parts here and assembling them into a whole. The word of service now has much more meaning than before. For example, in relation with a small modification of original solution it may include to discover hidden problems, co-work with customer to modify solution, reschedule installation, document and report all changes to environment protection department.' (Project Manager of M)

However, most of interviewees also say that service is difficult to measure and difficult to describe so that it is difficult to turn customer-centric attitude into standard operation. First of all, it is difficult for firm to anticipate whether the internal or external environment will keep unchanged during the project. Then, even the environment maintains static every service provider may interpret the instruction differently. Therefore, what service an employee can develop and provide is subject to his/her attitude, interpretation, and specific service capabilities.

However, it is also noticed that customer-centric attitude among individuals vary significantly. Moreover, employee's customer-centric attitude may change according to his/her capability to perform specific service. As one interviewee ever mentioned:

'The willingness of employees to perform better service is mainly related with firm's rewarding or punishment policy. If we have punishment policy in place employees will be more active to provide better service and avoid complaints from customer. Also, if the employee is more skilful, he/she will be more active to perform service.' (Owner of firm C)

It is noticed that service provider who is more confident in himself/herself may appear more willing to provide service to customer, otherwise he/she may choose to ignore or try to dodge customer's requirement. The explanation may lie in the fact that firms usually have explicit punishment policy based on customer's complaints but are lack of applicable rewarding based on employee's good performance (Owner of firm C, interview, April 2019).

To sum up, although interviewees pervasively agree that frontline service providers should have customer-centric attitude and develop services according to customer needs, managers are extremely worrying about individual capabilities. As Vargo and Lusch (2004, p.11) claim, the on-site interactivity, integration, customization, and coproduction are the hallmarks of a customer-centric view. Therefore, to improve the quality of service provision firm need not only put emphasis on employees' service attitude but also develop their service capabilities, and with the complement of appropriate motivation policies.

4.5.2 Cross functional-units coordination capabilities

The second capability highlighted by interviewees are cross-functional units coordination capability. Traditionally, people believe it is project manager who should take the responsibility of coordinating with internal functional units, external partners and customer, but now the prevalent idea is every service provider, including the project manager and frontline service providers, should possess such capability.

Because the value of integrated solution in water treatment industry is now relying on high quality service. Furthermore, high quality service to customer must be developed on the base of high-quality cooperation between principal contractor and its internal and external partners. Therefore, it is necessary for team members to have more interaction with internal colleagues, external partners and counterparties on project implementation location. Team members' individual capabilities including communication and coordination are essential foundations to facilitate information and knowledge exchange, and productive team working.

Individual communication and coordination capabilities are valuable at multiple interfaces for example: between colleagues inside project team, between project team and external partners or stakeholders, and between project team and co-creators on customer side. As interviewees have recalled:

'Good communication and coordination between colleagues are critically related with whether the project can successfully complete. We ever experienced numerous mis-communication and misunderstanding during previous projects and every time it leads to distrust or conflict, and finally will cost us time and money.' (Project Manager from Firm M)

Project team also need to keep good communication with partners and external stakeholders such as government authorities.

'Maintaining good communication with partners is important, for example if the buyer has good communication and relationship with pump supplier, we can get products much quicker than usual. And keep good communication with environment protection department is always good for us to receive construction approval and the final acceptance.' (Project Manager from Firm M)

It should be noted that team members should also keep good communication and coordination with the co-creators on customer side, because quite many jobs cannot proceed without participation of customer's employees for example:

'How will the Boss on customer side rate our deliverables to great extent depends on how well his employees can use and take care of those equipment. Therefore, it is always worth for our project team to teach them and to discuss about all the potential incidents. In other words, the project quality, at least partially, will be determined by customer's employees.' (Project Manager from Firm C)

To sum up this subsection, most of interviewees see service providers' communication and coordination capabilities as essential qualities to provider services and to fulfil on-site tasks. Successful project execution and high customer satisfaction are greatly affected by how well service providers in project team can communicate and coordinate with cross-functional colleagues as well as co-creators on customer side. However, different people may see the importance of communication from different perspective for example the project manager from M mainly focuses on the efficiency of project operation and the project manager from C may focus on marketing influence.

4.5.3 Multitalented service providers

Traditionally, the project teams in water treatment industry are organized by multi-talented team members. For example, project manager usually acts as key coordinator, key decision-maker, commercial representative, and public relationship representative. In the similar way, a system design engineer may also play role of technical consultant or operation trainer.

The most popular reason to organize in this way is that projects are usually one-off assignments, i.e. every project will go to end when contracted system is delivered and the ownership is transferred to customer. Consequently, the repetitive tasks on delivery site are relatively in limited amount, therefore it is possible to have less but multitalented team members. The second reason to do so is multitalented team members can ease communication burden and improve work efficiency, which will hopefully lead to more slack time between sequential stages. Thirdly, multitalented team members are expected to improve project quality because of improved coordination efficiency and high-quality information or knowledge management. Last but not least, using more multitalented team members also imply fewer employees and lower human resource costs.

One project manager talked about how he usually chooses team members:

'In my project there are only 5 members reside at delivery site. Other people, if we need, either will come from head quarter temporarily or will be hired at the place where the project is located. I am responsible for project management, coordination with all relevant parties, public relationship, recruiting new staffs, and all other stuff without specific person in charge. Other team members are in similar situation for example the team member responsible for procurement is also in charge of logistics, team member who is responsible for documentation also takes care of IT system.' (Project Manager from firm M)

To sum up, using multitalented staff is quite popular in project teams of integrated water treatment solution. The form of multitalented team members may vary at system delivery site. One form is that a team member plays several roles in same stage, for example office staffs reside at delivery site. Another form is a team member can play different roles in sequential stages, for example most of the workers may have varying jobs from metal working to installation. Therefore, multitalented employee is not only the criteria required for office staffs but also for workers on delivery site.

4.5.4 A blend of technical and commercial capabilities

The commercial capabilities of team members in integrated water treatment projects are catching more and more attention from top managers. One reason is that the range of tasks which project team is expected to fulfill is expanded. Project team is not only responsible for delivery, installation and transfer of ownership to customer but also responsible for providing series of services including for example technical consulting, solution modification, system upgrading and operation management. Therefore, team members must extensively interact with customers, exchange information and knowledge, identify opportunities and co-create solutions. Commercial capabilities, on the top of technical capabilities, are critical for all service providers in integrated water treatment project to accomplish tasks which otherwise marketing, sales or public relationship staffs should undertake.

Even for positions like solution design engineers and maintenance technicians, commercial capabilities are nowadays regarded as essential quality. For example, it is noticed that, project manager or solution engineers often host project seminars together with colleagues from sales department, where they will discuss and articulate a roadmap to seize contract. And for maintenance engineers, it is widely recognized that they are key roles to identify opportunities which potentially will foster new service contract and even long-term operation management business in the future. For example, it is recalled that:

'There are inappropriate equipment or treatment processes in customer's factory. These problems may never be detected in original design but will appear along with changing work condition. Maintenance engineers with good business sense will identify such kind of opportunities and promote either maintenance or replacement proposal to customer. Therefore, maintenance engineer can play roles of early stage sales, and their recommendations are appreciated by customers.' (Team member from M)

Another benefit comes from individual commercial capabilities is service providers can encourage their co-creators on customer side more actively participate in service co-creation. For example, logistics coordinator with good commercial capabilities can have good networking with logistic partners and customer's employees. Supported by their cooperation it is much easier for the coordinator to figure out flexible delivery solution (Team member of M, interview, April 2019). Likewise, on-site installation or civil construction also need lot of customer involvement. Team members with excellent commercial capabilities are more likely to improve understanding and cooperation with customer and other stakeholders, so that will proceed tasks more smoothly.

The development of internet and communication technologies have dramatically extended the possibility of marketing and sales for project team members. The "circle of

friends” has brought business opportunities on the screens of mobile phones with great accessibility and productivity. Mobile technologies can create a virtual commercial environment which enable every team member involved can play sales or marketing roles effortlessly. One on-site engineer described the changes mobile phone has brought:

‘At delivery site I need to follow up all the spare parts I have applied to buy and I also need to do lots of test works in workshops, but mobile phone enable me to communicate with potential suppliers very easily. By mobile phone I can also discuss work schedule with customer, report test results to project manager, and even sign the acceptance bills for suppliers.’ (Team member from C)

In sum, in this study I have found that firms usually see individual technical background in combination with commercial capabilities are essential criteria of every team member. Especially, managers with leading customer-centric attitude will position project team as a full-functional business unit to carry out high quality and full-range of services. Putting more emphasis on individual commercial capabilities on the top of technical capabilities will reinforce project team’s overall capabilities to deliver better solution as well as capture more opportunities.

4.5.5 Knowledge management capabilities

It is widely recognized that knowledge management capabilities are valuable for developing capabilities both on individual level and on firm level. As interview data have shown, managers are now concerning about whether firm capabilities can meet ever rising customer expectation. For firms employing servitization strategy, regardless intentionally or unintentionally, the performance of service provision relies on the collective individual service-specific capabilities. Posselt & Roth (2017: p94) claim that frontline team members capturing customer’s information can significantly improve project manager’s cognitive flexibility. As one interviewee mentioned:

‘Things are changing very quickly on delivery site, so that everyone must learn quickly the latest situation in relation with his/her responsibility and modify his/her plan accordingly. We have evening meeting to summarize and discuss such information every day. However, we rely on every team member to collect and report such information and the accuracy of such information will directly affect our decisions.’ (Project Manager of S)

Obviously, employee’s individual knowledge management capabilities which enable one person to gather, utilize, share and transfer information and knowledge are critical for individual performance and project performance. Vargo and Lusch (2004, p.9) argue that the primary flow in service provision is information; service is the provision of the information to (or use of the information for) a consumer who desires it, with or without an accompanying appliance. They further stress that supplier relationship, brand identity, process coordination, customer loyalty, employee loyalty, and switching costs all depend on various kinds of information.

Concerning that most of team members are temporarily work on specific project, it is extremely important that he/she can recognize the situation, figure out the right approach by himself/herself quickly, and join into the project cooperation as early as possible. For

new employees, quick learning and team working are particularly emphasized by project managers.

'When talking about the criteria of new employees, we in project especially value quick-learning and team-working. As you can imagine, every project normally runs at a very quick pace and only quick learner and team player can catch up colleagues and contribute to the group.' (Project Manager from C)

In sum, the right candidates for project team should be able to capture, interpret, absorb and transfer information or knowledge rapidly. Collectively, the project team can work as an independent entity which can gather, process, sense-make and utilize project relevant information or knowledge efficiently. It is believed that project team with high knowledge management capabilities will have advantage to gain higher trust from top management thus achieve higher decision-making autonomy. And eventually, it will enable project team to reach higher operation efficiency, longer slack time, better execution quality, and higher financial returns.

4.5.6 Capabilities of communication and coordination with top management

During my interviews the capability of understanding firm strategy was repeatedly mentioned by interviewees. This capability will enable project manager and team members to understand and move at the same pace and in the same direction with top management team. The reason why this topic becomes salient is that top managers, project managers and project team members quite often feel difficult to meet at the same point in their interaction and cooperation. Usually, misunderstanding or different opinions will lead to delay of decision-making and even internal conflicts. This topic is also related with how much autonomy project team can have and how effectively project team can react to changing environment.

However, the interview data show the question of how the decision should be made in project-based firms cannot have standard answer yet. For example, several interviewees have more or less similar opinions emphasizing that project team should firmly stay in the same line with top managers. They have words similar as:

'The responsibility of project team is to execute project as what the contract has promised, and the project manager should stay in line with top managers and make sure the project team's operation can always comply with the conventions of parent firm.' (Owner of M, Owner of S, Team member from C)

In the contrast, there are also project manager and team members saying that project team should have bigger autonomy so that it can move quickly and stay closely to customer. The independent or decentralized organizational structure can effectively increase customer satisfaction and is long-termly beneficial to firm's business development. Their opinions are similar as:

'Project team should have greater freedom to decide on-site changes in execution for example we can discuss with customer and decide to modify our schedule or revise installation layout. It may not cause big cost increase but do takes times. However, working closely with customer and trying

to meet customer's needs will make customer satisfied and project can go more smoothly.'
(Project Manager from M)

However, I also heard the owner of C expressing his support to decentralized organization. In his terms project-based business should choose decentralized management structure, i.e. project team having bigger decision-making autonomy. However, interviewees also mentioned that the premise to empower project team is the project manager and team members should fully understand firm policies and have high-level managerial capabilities. Therefore, firm will particularly value employees who have long working experience and deep understanding of firm culture. In relation with this topic, I also found that business owners prefer to choose senior employee and friends of them as project managers. The potential reason may lie in the high trust and same culture between top managers and their project managers. As one CEO ever told:

'Senior project managers usually are better at socializing with customers and government authorities therefore they can create better atmosphere for project execution. At the same time, I like to choose senior project managers because we can better understand each other, so that it is much easier for us to communicate and reach at the same point.' (Owner of S)

As a summary for this subsection, I found whether firm top managers and project team, especially the project manager of the team, can understand each other and agree with the same decision is the key consideration in decentralization approach. If the project manager and team members can deeply understand firm culture and share the same value with top managers, they are more likely to have bigger autonomy in decision-making.

4.6 Capability development mechanisms in project-based integrated solution

In this study part of my interview questions are formulated to collect information in relation with applicable mechanisms to develop individual capabilities. These capabilities talked here are believed particularly critical for the success of project-based integrated solution in water treatment industry. Interview guidelines were designed according to what Rabetino et al. (2017: p144-156) have proposed key initiatives, which they believed are essential for business performance of servitized firms.

According to Rabetino et al. (2017: p154) researchers and firms should pay more attention to empirical study of several key initiatives. First and foremost, firm should build project team with qualified project manager and functional groups, and every functional group should be organized by double-hat (dual-hatted) team members. Then, firm should hire service-oriented new employees with commercial profiles and skills. And then, firm could acquire new talents through merge and acquisition methods and emphasize the integration and harmonization of acquired talents with existing processes. In addition, firm should link service providers' skills to jobs and invest in value-based training, i.e. strengthening existing product-oriented skills with service-oriented knowledge and skills. Furthermore, firm should create service-oriented bonus structure, setting incentive policies to encourage service providers to devote more time to profitable customers. Finally, firm should build practical information or knowledge management systems which can allow service providers to develop a shared understanding of previous projects. The goal of setting up such knowledge management system is to facilitate service

providers to access and to benefit from organizational knowledge base, and to utilize such knowledge for future business.

4.6.1 Establish networks to capture prominent project managers

The first mechanism which I found supportive to the initiative of organizing a competent project team is establishing a network of project managers.

Appointing a project manager with solid professional expertise and outstanding managerial capabilities is critical for project success. However, experienced project managers are rare resources so that firms in this industry often need to compete for them. The popular solution is that business owners or top managers build up his/her networks of project managers. As interviewees mentioned, a network of project managers will not only ensure a stable supply for firms which has not enough experts, but also motivate project managers to continuously learning and improve competencies.

'On the one hand, we cannot afford to employ many long-term project managers, and, on the other hand, employment not necessarily will generate the best project managers. It needs many project experiences and it also needs competition. However, through my personnel network I can always find the appropriate candidate for next project.' (Owner of C)

In water treatment industry, project managers can be employed in two ways, long-term employee or project-based employment. There is an informal community composed by prominent project managers who prefer flexible but high-paying project-based employment. It is also said that a CEO, during years of business experience, usually can accumulate a notable personal network including all kinds of talents valuable for his/her business. Getting access to a network of prominent project managers is a priceless asset for every business owner. Long term interaction also can eliminate the strangeness and increase mutual trust and the culture fit, which can pave the way for flexible project team building up.

4.6.2 Encourage internal move to cultivate multitalented service providers

The second mechanism emerged during my interviews is encouraging employees with technical background to move into management or business positions. Unlike job rotation, the movement appreciated in interviewed firms is from technology-intense position to positions more emphasizing management or socialization skills. Part of such movement is the result of promotion for example from operation field to project team in office, and the rest is accomplished by some most talented and ambitious employees. For example, all the project managers interviewed in my study had engineering education background. To explain this phenomenon, one project manager said:

'I have worked in this company for seven years. In the first three years I was engineer in different project teams. Now it is the fourth year I have been working in the position of project manager. But, between two projects I will also work in head quarter, assisting

after project service or new solution design. I think my technical background is the key for me to be able to fit in multiple positions.’ (Project Manager from C)

Likewise, one CEO stressed that:

‘The reason why engineers have more opportunities moving up to higher positions is most positions, for example positions in project team, require employees have deep understanding of our solution so that they can more efficiently solve problems for customers. Moreover, engineers serving in project team usually can have lots of chance to learn social skills. It is difficult for employees without technical background to make clear the technical details customers caring about.’ (Owner of C)

Therefore, my study has found that in water treatment industry technical background is solid foundation for individuals to become a master of multiple tasks. It is not rare that an engineer can change position into sales, marketing, or management roles, but an employee who only has business education background may find himself/herself having much smaller career flexibility.

In sum, allowing or encouraging employees with technical background to take most positions, especially positions in project team, can cultivate more multitasking employees and improve firm’s overall competencies. Comparing with other talent capturing methods, for example recruiting from competitors or talents market, internal move and career development can enable firm to harvest competent employees with higher loyalty but lower cost. Therefore, it is the most popular way through which employees can get promoted or access more career opportunities.

4.6.3 Hire service-oriented employees and train existing ones with commercial skills

One reason beneath employees’ internal move is firm need more employees with technical background but also capable of undertaking commercial tasks. Traditionally, firms like those in my interviews are product-oriented, focusing on manufacturing. When more and more firms turned to service-oriented, devoting to serving market with project-based integrated solution, they need talents to fill in service-related positions. Qualified talents to develop service business are those possessing both technology and business knowledges.

The common approach adopted by firms in interviews is recruiting service-oriented employees with commercial profiles and skills. For example, one project manager ever described as below:

‘Team members we are looking for should have business talents or at least be skilful in communication, negotiation and cooperation. The whole project team is a business unit and we have clear financial target and, meanwhile, our business is very much relying on old customers. Therefore, we need everyone in project team have some business sense, caring for customer satisfaction and keeping eyes open for new opportunities.’ (Project Manager from M)

It is notable that integrated solution is service-intensive business so that team members’ customer-centric attitude and service-oriented skills are crucial for project performance.

Firms expecting to seize more contracts in the future are keen on recruiting employees with a blend of technical expertise and commercial skills. Therefore, it is one of preferred mechanisms to recruit new employees having commercial profiles and skills on the top of job-related other competencies.

4.6.4 Acquire talents from competitors

As I have learned from this study hiring staffs with project experience from competitors are now quite popular in water treatment industry. Employees such as project manager and project team members are among the most expected talents because of their blended competencies and because of sometimes urgent demand. Firms usually search and negotiate with interested candidates via head-hunters.

With regard the criteria, firms usually require candidates have solid project experience, education background and duty-specific certificates. Particularly, firms nowadays will emphasize team members' learning, communication, coordination and teamwork skills. However, when searching for suitable candidates from competitors firms need take into considerations the culture difference. One project manager told:

'We prefer experienced employees. But, if the new employee ever worked for our competitors, we have to consider whether he/she can quickly learn our firm culture. Specifically speaking, what attitude to customers, jobs, partners and colleagues because it is related with whether he/she can quickly merge into teamwork.' (Project Manager from S)

In addition, firms also consider individuals in project team, including project manager and team members, as priceless assets. Most of managers have realized that in water treatment industry talents are the most important determinants to business success. As one CEO noted:

'Project teams are always moving from one place to another but, in my opinion, they are my biggest asset. The more projects they have experienced the more knowledge they have accumulated, so that the more valuable they will be. We value long-term service as our customers do.' (Owner of C)

In sum, one finding from interviews is that project managers and project team members are employees with the highest turnover rate in water treatment industry. One possible explanation I found is that firms could not have enough contracts to keep those employees in projects, and another explanation may be that firms are competing for valuable talents. However, if managers can effectively develop firm culture for new employees, capturing talents from competitors is useful and maybe the quickest way to improve firm capabilities.

4.6.5 Map employees' skills & implement service-oriented trainings

Internal training is important mechanism applied by firms to develop employees' competencies. In my interviews I found there are several types of training program

available for project team members including apprentice, short-term training, and informal training such as seminars or meetings.

As a popular policy, junior employee and new graduates hired for project teams need go through an apprentice period which may last from three months to one year. During that period every new employee will work as an apprentice assisting his/her trainer. When new employees get certificated at the end, they can work independently in project team. Thanks to trainer's close company apprentice is looked as the most reliable way to cultivate qualified employees, especially in terms of maintaining same culture and possessing firm specific knowledge.

Considering the changing character of project operation, the improvement of employee competencies can also result from informal training such as seminars or meetings. One project manager noted the importance of

'At delivery site we often have short meetings, sometimes updating progress information in one group, sometimes reviewing works and discussing the pros and cons, and sometimes just coordinating works between different groups. These meetings are very important for team members to learn the latest information, to modify individual plan, and to fit everyone's work into the whole picture.' (Project Manager from C)

Frequently participating such on-site meetings, new team members can learn how to communicate and coordinate with colleagues in project team and how to balance individual work and teamwork.

Beside training programs, I also found that learning environment and relevant facilities are also beneficial to employee competencies development. While trainings and meeting improve organizational learning, learning environment and facilities, for example project documentation and IT system, can effectively facilitate individual learning.

It is notable that trainings focusing on employees on customer side may also contribute to project performance. As I have learned from literature review that service is co-created by service providers and counterparties on customer side. Therefore, the performance of service business would be underpinned by participants' individual competencies from both sides. Particularly, the Boss, managers and ordinary employees on customer side get to know delivered products and services mostly through "mouth to mouth marketing" made by their own employees. Such employees include the co-creators of project members who participate delivery, installation and transfer and those who run and maintain system after project completion.

One CEO explain his understanding to disclose the relationship:

'Most of problems in relation with water treatment system are caused by inappropriate control or modification of pumps, instruments or chemical substances in daily operation. Therefore, the quality reputation of our system is greatly related with customer employees' knowledge and skills. Training customer employees is one of key tasks project team need to strengthen.' (Owner of C)

To sum up this subsection, most of managers have realized the importance of developing position required and service-oriented capabilities for project team and team members. There are various mechanisms to improve individual or project team capabilities including formal and informal mechanisms. Additionally, because of the co-creation

character of service business some firms have started to provide more training or instruction to customers' employees, the co-creators of services.

4.6.6 Create service-oriented motivation policies

There are several motivation policies popularly been used in interviewed firms including bonus and promotion in relation with individual performance. These motivation policies act as effective mechanisms motivating frontline service providers to develop individual capabilities.

Before the project manager and every team member being recruited into a project team, they will be offered a bonus scheme. This scheme will link their bonus with KPIs, i.e. evaluation system of their key performances indicators. Usually, bonuses will represent a significant part of every project member's income, therefore it will encourage project manager and team members to improve their performance.

As one team member recalled:

'The income of project members consists of salary and several types of bonus. The number of every bonus is related with factors for example project time duration, profit rate, project saving, customer's assessment, numbers of complaints, etc.' (Team Member from C)

Beside bonus, prominent employees can also get promotion. However, in water treatment industry, internal move can also be treated as promotion because people usually move from low-pay positions to high-pay positions. For example, an engineer worked in project team usually has much higher income than otherwise he/she would have in workshop. Similarly, a salesperson moved from engineer position can have higher income as well as better career development potential. Together, motivation policies will play the most important roles encouraging employees to learn and to develop individual competencies. As one owner told:

'The increase of income is the main reason encouraging employees with technical background to move into sales department or project team. I'd like to see young employees to take such challenges because it is good signs both for themselves and for company.' (Owner of C)

Regarding to motivations, personal reputation in community is also an unneglected factor to encourage individual learning and competencies development. High-level experts such as senior engineers and project managers usually are members of certain networks. As I have discussed before, firms are used to recruit high-level experts through networking or peer recommendation. Therefore, reputation is treated as personal asset and developing individual capabilities has become self-invest. It can be proved by several interviewees' similar opinions:

'Water treatment industry is a small community, so it is normal that we know each other. Mouth-to mouth introducing jobs is quite popular. I am self-motivated to work hard and learn everything needed in project.' (Team Member from C)

As a brief summary, keeping high motivation is believed critical for service-oriented integrated solution. There are multiple motivation mechanisms in water treatment

industry aiming to encourage individual learning and competencies development. Firms usually can use mixture of such mechanisms, i.e. bonuses, promotion and internal move, and personal reputation to improve organizational competencies.

4.6.7 Utilize capability development technologies

Considering that project teams are of temporary and fluid organizational structures, and of geographical and administration distant from parent firm, managing knowledge assets and sustain competence will face various challenges. This study shows that firms see knowledge management systems as essential mechanism to protect knowledge or information assets, to preserve firm capabilities, and to share and transfer capabilities from employee to employee and from project to project. Firms in this study popularly use IT equipment for example computers, documentation software, digital audio and video equipment to record, share and transfer project related materials and knowledges. Although most of such activities are informally organized, they can significantly improve the effect of learning activities and capabilities development both on individual level and firm level.

Project documentation is the most traditional way to record the history of every project. However, the data from interviews show that both top management and project team do not feel project documentation can reflect the most valuable information in relation with every project. Documentation in detail is very time demanding and sometimes it is very difficult to record why something has happened and how it has been solved. For example, when one installation team arrived installation place, they found that customer's building was already completed, and the door was not big enough to move in a container. The installation group has to cancel the container order and alternatively prepare to fabricate at installation site. To make sure the final quality they discussed with customer and compared several options. Finally, they decided to order the container in parts and left the least works to be finished on-site. Although the process was quite complex and it was unanticipated by both sides, the customer was quite satisfied with installation team's proactive attitude and professional service. However, in project files there is only very brief description and lessons learnt from this experience can only be found in team member's memory.

On the contrary, regarding to the popular way to record project information and knowledge several interviewees have mentioned the application of social media.

'Nowadays everyone has at least one mobile phone and using Wechat for on-site communication is very convenient. If someone has problem, he usually just needs to shoot a short video and upload to our virtual group. All people in this group can learn what's happening there and everyone can put in his suggestion.' (Project Manager from S)

Interviews have also shown that, except the common office software, formal project management software or customer relationship management (CRM) system are not popularly or systematically used by frontline team members. One reason may be that firms in these interviews are small enterprises so formal management systems are not yet popularly used; and another reason may be that people still think in project management only project manager needs to take care of managerial issues. It has raised question that

current management system may be not able to monitor or record how every team member provide service, so that it is also difficult to measure the quality of service.

In sum, it seems there is lack of appropriate technical mechanism to manage information and knowledge generated from every project. On the one hand, most of managers feel managing information and knowledge is important but, on the other hand, interviewees feel current management systems cannot reach the frontline of service-creation or it is too “outdated” to motivate frontline service providers to use it. Alternatively, frontline service providers prefer to use informal mechanisms for example social media Apps to record and share information. This situation reminds us that there may be a market need calling for developing mobile Apps to better manage service business.

4.6.8 Data summary and analysis

Recorded interviews data were summarized into six themes: Competition, Strategy choices, Project manager’s role, Team members’ roles, service providers’ influence on team capabilities, and mechanisms to develop capabilities.

With respect to competition, the owner of S is obviously pessimistic and characterized by saying “market is shrinking”. It seems that he has not figured out a clear strategy to cope with challenging market situation. However, he is quite aware of the importance of employees’ individual capabilities and the correspondent influence upon organizational performance. He also highlights the importance of project team keeping in line with firm top management and prefers to choose senior employees or friends as project managers. Meanwhile, the project manager from S points out that firm should hire new employee with quick-learning capability, employees from competitors should learn new firm culture, and project team should flexibly use mobile phone and social medias to improve the efficiency of on-site information exchange and learning.

However, comparing with data from M and C, data from firm S are apparently incomplete, reflecting the lack of careful consideration. Therefore, the data analysis will focus on firm M and firm C.

It’s worthy to note that opinions appeared in table 3 are only cited opinions from M and C and should not be looked as the whole interview records. However, these are the most typical statements made by interviewees and to some extent represent respondents’ special consideration, therefore I feel it is worthy to be cited, summarized and analyzed. Hereinafter opinions in every theme will be briefly compared and the priorities will be explained.

First and foremost, although there are contradictory opinions about whether project team should be more autonomous all firms look competent project manager and team members as rare assets. This could be interpreted as that project manager and team members are playing critical roles in project-based integrated solution and are determinants of nowadays business performance. The scarce of human resource in China water treatment

	Firm M	Firm C
Competition	bidding process is transparent--sales and marketing help little-- customer emphasizing on technology advancement and and price (Business Owner)	leading companies can have 30%+ price (Business Owner) ouer chance--providing more customized service- (Business Owner)
Strategy Choices	put more emphasis on new technology or new product (Business Owner) we need know better than competitors and customers (Project Manager)	launched service-oriented strategy--planning to promote this idea to every employee (Business Owner) We have seen opportunities in providing service (Business Owner)
Project Manager's Role	project team need have quick response to customer--too much reports and negotiation lead to low efficiency (Project Manager) project team need participate project marketing in early stage (Project Manager)	
Team Members' Roles		competent logistics coordinator can create cost advantage in project (Project Manager)
Service Providers' Influence on Team Capabilities	project manager should stay in line with top manager (Business Owner) customer want trouble-free--the word of service has much more meaning than before--we should provide wider service (Project Manager) good communication and coordination--project can successfully complete--bad communication leads to distrust and conflict (Project Manager) good communication with supplier--get products quicker (Project Manager) multitalented staff are popular in project team— (Project Manager) project team should have greater freedom in decision-making and work closely with customer (Project Manager) maintenance engineer can play roles of early stage sales (Team Member)	quality reputation of our system is greatly related with customer employees (Business Owner) existing motivation policy (punishment for complaints) - -skillful employees are willing to provide service-- otherwise dodge (Business Owner) customer satisfaction to great extent depends on customer employees (Project Manager) quick-learning and team working are important qualities for new employees (Project Manager) mobile phone enable me to communicate with suppliers easily--handle daily work (Team Member) stay in line with top manager (Team Member)
Mechanisms to Develop Capabilities	Hiring service-oriented employees and training focusing on commercial skills (Project Manager)	through personal networks can find project manager (Business Owner) most of positions require technical background— (Business Owner) project teams are biggest assets-- prefer long term employment (Business Owner) quality reputation is greatly related with customer employees-- training customer employee need strengthen (Business Owner) income increase encourages employee position-move--it's good signs for employees as well as for company (Business Owner) technical background enable me fit in mutiple positions (Project Manager) informal training are important at project site— (Project Manager) “mouth to mouth” introducing jobs is popular--I am self-motivated to work hard (Project Manager) we have different bonuses (Team Member)

Table 3: Summary of interview citation in themes from firms M and C.

industry also reflect that firms' transformation from manufacturing into servitization are pulled by market demand instead of pushed by firms themselves.

Secondly, interviews show top management's vision still has fundamental influence on long-term business performance. Top management, business owners in this study, not only determine long-term invest, business plan, management processes and policies but also affect project operation through assigning project managers. The business owners from M and C have different interpretation about the market competition. While the owner of M mainly feels market getting worse the owner of C has seen opportunities from providing more customized service. Particularly, the owner of C mentions that leading firm could enjoy higher profit in contract bidding, which eventually encourages visionary managers to employ proactive service-oriented business model. On the contrary, the owner of M highlights technology/product development, seeking to gain superior position in traditional competitive landscape.

Thirdly, with different vision, top management will also affect the management structure and decision-making processes in project operation. For example, owner of M stresses that project team should firmly stay in current hierarchical managerial structure. Meanwhile, he also underestimates project manager's flexible and autonomous decision-making. However, data from interviews show there is critical disagreement between this business owner and his project manager. As Vargo & Lusch (2004, p.281) noted that, in service business, frontline employees play key roles in anticipating customers' needs, customizing the service delivery, and building personalized relationships with customers, I believe the project manager of M has more reliable thoughts and market sense. Therefore, in later analysis I will take opinions of owner of C and project manager of M as constructive responses to challenges derived from servitization.

Another notable issue is that only project manager from C explicitly stress the influence of frontline service providers' dynamic capabilities. He takes the case of on-site logistics coordinator as example and points out that frontline team members (service providers) could mobilize resources and create competitive advantage. Moreover, he is the only person who has noticed the potential influence of customer's employees upon project performance and reputation. Given Vargo and Lusch's insights in last paragraph in addition to that firm C has launched service-oriented business plan, it is highly possible that he may have intentionally studied service business. Therefore, I believe his opinions are worth taking into account.

Moreover, multiple interviewees state that mobile phone and social media are popularly been used by team members for their daily work. Although such applications are personal and informal, considering the ever-improving functions and convenience of such ICTs, it is necessary to take them into consideration for future project management. Meanwhile, managers should also pay more attention to other informal approaches for communication, recruiting, learning or training at project site.

Furthermore, interviewees from C coincidentally talked about motivation methods which they have experienced in C. Although I agree that firm should make out flexible and productive motivation policies, we could not have time to study closely and to compare different options, so that I cannot draw conclusion which approach is the best in this thesis. However, I do feel it is important to have further study focusing on different motivation

mechanisms and, especially, to have study linking motivation mechanisms with applicable measurement mechanisms for service business.

Last but not least, interviews also show all three firms benefit from external resources especially human resources. On the one hand, it reflects the extreme importance of talents and what they possessed knowledge and capabilities towards service provision. On the other hand, it also shows SMEs should more emphasize using human resource and knowledge instead of possessing these assets. In other words, in knowledge-intensive business such as integrated solutions, small project team with high individual dynamic capabilities can coordinate and re-configure much more resources and may be able to achieve better business performance than big project team with low individual dynamic capabilities.

5. DISCUSS AND CONCLUSION

The project-based integrated solution, represented by interviewed firms in water treatment industry, has displayed similarity with traditional project-based business. The project management typically will face challenges derived from temporary decentralization, autonomous organizational units, and fluid organizational structures (Söderlund and Tell, 2011a, p.208-214), and face challenges aiming to successfully proceed projects and sustain long-term competitiveness. However, the increased proportion of service in total offerings has led to the significant difference between projects of integrated solution and traditional ones. Because service is co-created by service providers together with their co-creators on customer side and the service production takes place with consumption simultaneously, the performance of integrated solution is fundamentally influenced by service providers and their co-creators.

The interrelationship between organizational dynamic capabilities and strategic actors of service provision are illustrated in figure 5. Overall, the characteristics of project operation combined with that of service provision will shape the idiosyncrasies of project-based integrated solution, leading to the differentiation of servitized firms from both traditional manufacturing firms and project-based firms.

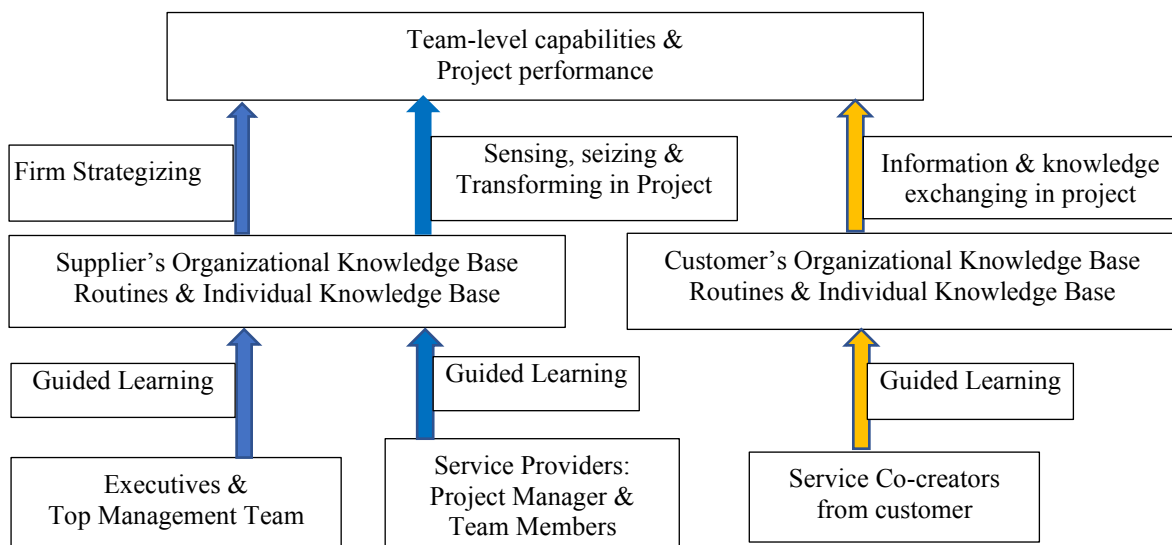


Figure 5: Individual influence upon team level dynamic capabilities in integrated solution

This figure shows that service providers, including project manager and team members, are main creators of team level capabilities, including ordinary capabilities and dynamic capabilities, and main guarantors of long-term competitiveness of integrated solution in water treatment industry. While firm strategy is mainly crafted by top management, top management may only be able to influence team level dynamic capabilities through firm specific policies or processes. The on-site decisions and activities around sensing, seizing and transforming are inevitably responsibilities of project manager and other frontline service providers. Consistent with insights made by Lovelock & Wirtz (2004, p.280) for service business, frontline service providers are not only important for operational

excellence but also key inputs of competitive advantage in project-based integrated solution.

While project manager creates and bear the main part of micro-foundations of team level dynamic capabilities, frontline service providers create and bear majority of micro-foundations of dynamic capabilities of individual service provision. Meanwhile, service co-creators on customer side also extensively participate in service co-production and transferring so that they also have significant influence on team level capabilities and project performance. Service co-creators play critical roles on the supplier-to-customer interface and exchange information or knowledge with frontline service providers. Therefore, their individual capabilities and the openness which enable service providers to access customer's knowledge base are critical for service providers to carry out service provision and capture information for project manager to make decision.

Corresponding to the research questions raised at the beginning of this thesis and the propositions suggested before empirical study, I will elaborate the research conclusion in three parts: 1) The roles of service providers in project-based integrated solution; 2) The influence of service providers upon organizational dynamic capabilities; 3) Capabilities development mechanisms in project-based integrated solution.

5.1 The roles of service providers in project-based integrated solution

Taking integrated water treatment project as example, the implementations of project-based integrated solution usually are carried out at delivery site near customers but far away from supplier's head quarter. There are apparent geographical and administration distances between firm top management and project team. Usually, the project manager will take the full responsibility of communication, coordination and organization for overall project operation. At the same time, operational tasks including the material procurement, logistics, installation, system integration, customer training and follow-up maintenance are conducted by project team autonomously.

Because members of project team including project manager and service providers undertake the final service provision, the project team contribute significantly to firm value creation. Evidences from this study are consistent with Routine-Performance relationship model (Abell et al., 2008, p.495) in which the performance of integrated solution mainly depend on routines and capabilities performed by individuals in project team. In other words, the individual capabilities of project manager and team members collectively constitute the micro-foundations of project team capabilities, including ordinary capabilities and dynamic capabilities. As interview data show, frontline service providers in project team need constantly evaluate internal and external situation, sense opportunities, assess risks, coordinate and reconfigure resources, and finally carry out best action for every step of service provision. Given service provision constitute big proportion of daily tasks and project team is organized with decentralized managerial structure, it is well founded to draw conclusion for the first research question that service providers, including project manager and other team members, assisted by service co-creators on customer side play strategic roles in provision of project-based integrated solution.

In line with Teece's definition (Teece, 2012, p.1398), it is the project manager who exerts distinct managerial capabilities in integrated water treatment solution. This study has proved that project managers play the leader and decision-maker roles in project-based integrated solution (Parkin, 1996, p.261-262). Similarly, team members or direct service providers play significant roles in service provision so that the organizational ordinary capabilities mainly rest on shoulders of project team members. Additionally, research evidence has proved that service providers, for example logistics coordinator, not only contribute to project manager's development of dynamic capabilities with in-depth customer information (Posselt & Roth, 2017, p.84) but also exploit individual dynamic capabilities to allocate resources and make decision for fulfilling operational tasks (Sanchez and Heene, 1996). This conclusion is consistent with insights from service business where frontline service providers are not only important for operational excellence but also a key input for delivering service competitive advantage (Lovelock & Wirtz 2004, p.280).

To be noted, this study suggests that the service co-creators on customer side will also significantly affect business performance of project-based integrated solution. The explanations lie in first, they will transfer knowledge to service providers so that indirectly contribute to service performance; and second, they will participate in service-co-creation so that directly contribute to service performance. This conclusion is also in line with what Vargo and Lusch (2004, p.11) proposed that customer becomes primarily a coproducer rather than a "target" and can be involved in the entire value and service creation process.

5.2 The influence of service providers upon organizational dynamic capabilities

Micro-foundations of dynamic capabilities are the distinct skills, processes, procedures, organizational structures, decision rules, and disciplines, which can undergird enterprise-level sensing, seizing, and reconfiguring capacities (Teece, 2007, p.1319). While traditional strategic management theories exclusively emphasize top management's influence, empirical evidences show the performance of project-based integrated solution mainly relies on the capabilities of project team. Therefore, service providers are looked as the rarest assets by firms providing project-based integrated solution.

In this study, I investigate project teams of integrated solution in decentralized managerial structures. Study shows that while project manager's entrepreneurial action and distinct expertise substantially constitute the micro-foundations of team dynamic capabilities, organizational routines performed by project team members are the main source of team ordinary capabilities. However, evidences from empirical study indicate that frontline service providers also contribute to organizational dynamic capabilities with their distinct skills and actions. On the one hand, service providers support project manager's development of dynamic capabilities with in-depth customer information (Posselt & Roth, 2017, p.84). On the other hand, frontline service providers also exploit individual dynamic capabilities for fulfilling operational tasks (Sanchez and Heene, 1996). To be noticed, there may be different kinds of micro-foundations of dynamic capabilities existing in project team. Those micro-foundations are for example transactive memory system in project team (Argote & Ren, 2012, p.1379-1380), cross-functional R&D teams, new product development routines, quality control routines, technology transfer and/or

knowledge transfer routines, and performance measurement systems (Teece, 2012, p.1397).

It is proved by theoretical study that dynamic capabilities and ordinary capabilities of project team are stemmed from specific knowledge base respectively. However, the dynamic capabilities are particularly connected with real-time creation of knowledge, especially in relation with change routines and analytical methodologies (Teece, 2012, p. 1397). Empirical study shows that entrepreneurial manager's dynamic capabilities, capabilities of evaluating and prescribing changes to the configuration of assets, are mainly related with long-term work experience. Although manager's individual dynamic capabilities are also influenced by education background and organizational processes such capabilities may mainly rooted in personal traits or captured through experience. In practice, firms sometimes have to recruit prominent project manager from outside such as from competitors or from personal networks. In the contrast, employees' ordinary capabilities can be cultivated internally with certain capability development mechanisms. Therefore, to develop organizational capabilities firm should take all potential mechanisms into consideration. While formal mechanisms including for example recruiting, training processes and motivation policies, informal mechanisms can include for example networks of external talents.

With respect to the second research question, empirical study shows that project manager's entrepreneurial action and distinct individual dynamic capabilities form the micro-foundations of team dynamic capabilities in water treatment industry. But frontline service provider for example on-site logistics coordinator can also create remarkable competitive advantage for project. Meanwhile, organizational routines performed by all service providers are the main source of team ordinary capabilities. It is worthy to note that service provision is conducted by service providers together with their co-creators from customer side. Empirical study shows that the openness of customer information or knowledge base is critical for solution supplier to build up joint understanding of customer requirement and to provide suitable service offerings. These evidences show that, beside service providers in project team, their co-creators from customer side will also significantly influence the performance and reputation of integrated water treatment solution.

5.3 Capability development mechanisms in project-based integrated solution

Capabilities expected to develop in project team should correspond to specific requirements of integrated solution business. Empirical study shows the overarched expectation from interviewees is that project team should operate to great extent like a full-functional subunit, i.e. capable of dealing with both technical and commercial challenges to provide better services to customers and to sustain firm competitive advantage.

Considering the context of providing integrated solution, the project manager and all team members should be, or are expected to be, prominent service providers. Typically, most of interviewees see a blend of technical and commercial capabilities, i.e. communication, negotiation and coordination capabilities, together with technical background as essential qualities to fulfil on-site tasks. Moreover, to meet rigid time, cost and quality requirement

service providers are expected to be multitasked, being able to fill in different positions or play multi roles in same project. Meanwhile, a customer-centric attitude in combination with capabilities of identifying opportunities and developing service offerings is appreciated both on individual level and on team level. All service providers are expected not only to solve problems agreed on contract but also proactively identify opportunities and continuously develop new services for customers. Furthermore, service providers need possess individual knowledge management capabilities, being able to capture, interpret, absorb and transfer information or knowledge rapidly. Finally, service providers in project team need have communication and coordination capabilities with top management, so that can easily reach the same point with top management and gain full support from firm head quarter.

Correspondingly, the mechanisms employed by firms should focus on service-oriented business and be excellent at for example decentralized managerial structure, changing customer requirement and environment, simplified and fluid organizational structure, and extensive customer involvement. Typically, developing capabilities should be addressed on three levels: individual level, group level and firm level. Meanwhile, firm should emphasize developing both ordinary capabilities and managerial capabilities but with different focus for project manager and service providers.

Hereinafter, as an answer to the third research question, mechanisms summarized for project-based firms to develop integrated-solution specific capabilities are:

- 1) Establish a network to capture prominent project managers. Since talented project managers are the rarest resource for project-based firms and most firms cannot employ a pack of talented project managers, getting access to networks of prominent project managers is a good option for project-based firms. Meanwhile, CEOs tend to hire senior employee or friends for project manager because those candidates usually share same value and have mutual trust with top management, which are critical for decentralized project operation.
- 2) Encourage internal move to cultivate multitasked employees. The most popular internal move applied by interviewed firms is engineers moving into roles of sales, project team members or managers. Comparing with other recruiting methods, internal move can enable firm to harvest competent employees with higher loyalty but lower cost.
- 3) Hire service-oriented employees and train existing ones with commercial skills. Providing customer expected service is the main melody in integrated solution business. Typically, firms will encourage employees with technical background to have commercial skill training and move into new position in sales department or project team.
- 4) Acquire talents from competitors. It is believed that capturing talents from competitors is the quickest way to improve firm capabilities. However, individual mindsets or work habits are in some degree history-dependent, so that how to integrate employees from competitors into a new culture is a tough challenge for managers.
- 5) Map employees' skills & implement service-oriented trainings. The approaches of internal training include formal approaches, for example apprentice or training program, and informal ones, for example seminars and meetings. It is notable that training service co-creators on customer side is also very important in project implementation phase.

Because services are co-created so that skillful co-creators from customer side are critical for successful integrated solution project.

6) Create service-oriented motivation policies. Firms should use mixed motivation mechanisms including bonuses, promotion and internal move, and network reputation to stimulate individual to develop competencies.

7) Utilize capability development technologies. Study shows that traditional project management system and documentation methods have limited influence on capabilities development in integrated water treatment projects. It is recommended that service providers could use informal approaches such as mobile Apps to improve on-site knowledge management, so that knowledge generated from completed projects can be shared and learnt, and eventually be utilized in future projects.

5.4 Theoretical implications

This study brings four-fold theoretical contributions: First, it broadens the understanding of the roles of frontline service providers in integrated solution business. Due to the idiosyncratic of service provision and the decentralized organizational structure frontline service providers, including the project manager and team members, play significant strategic roles in the business of project-based integrated solution. While project manager plays the single most important decision-maker in project team, ordinary service providers are not only responsible for operational tasks but also contribute to project manager's decision-making; second, it deepens the understanding about the interrelationship between individual capabilities and organizational capabilities. For project-based integrated solution the project team level dynamic capabilities are underpinned by individual dynamic capabilities of both project manager and team members in their respective degree; third, it explores the micro-foundations of dynamic capabilities which could sustain competitiveness of project-based integrated solution. Firm can leverage serious of mechanisms to develop service-oriented capabilities for frontline service providers thus to improve performance and sustain organizational competitiveness; and fourthly, this study also gets primary findings suggesting that service co-creators on customer side also significantly influence team level capabilities and project performance.

5.5 Managerial implications

This study also can bring multiple managerial contributions. For example, it has provided insights for managers to reconsider firm organizational structure, decision-making processes, human resource and knowledge assets management issues. This study has proved that decentralized decision-making and empowerment of project team are essential for successful project implementation. Meanwhile, this study shows there are applicable mechanisms to develop individual and organizational capabilities for integrated solution business. Finally, this study also reminds managers to put more emphasis on developing capabilities for service-creators on customer side.

5.6 Societal implications

This study also generates valuable societal contributions especially for countries in emerging market. On the one hand, this study reveals the risks firms and individuals may have to face when embracing servitization strategy. While in developed countries servitization has been studied for more than two decades manufacturing firms in emerging market for example China just encounter this trend in recent years. The transformation from product-oriented business to service-oriented business entails huge impact on firms as well as on individuals. As this study shows business owners are pushed by this trend to provide more and more services, but both firms and individuals are in lack of awareness in terms of what challenges are there and what changes they need make. As a result, unprepared firms may face shrinking market and employees may lose jobs. On the other hand, this study also provides valuable insights for education institutes and young generation to put more emphasis on building customer-centric attitude and developing service-oriented capabilities. Meanwhile, this study indicates that social medias or mobile applications, for example Wechat, will more and more be applied in business and provide unprecedented convenience for servitization.

5.7 limitation and future research directions

In this study my focus is project-based integrated solution and the research objects are narrowed down to SMEs in water treatment industry in China. These conditions lead to multiple limitations both in theoretical and managerial implications. First of all, in servitization research field there are at least three research domains including the PSS community, the solution business community and the service science community, and the solution community further consists of three clusters: customer solutions, project-based integrated solutions, and operations management (Rabetino et al., 2017, p.353). Findings from this study can only fill gaps located in research field of project-based integrated solution.

Meanwhile, the managerial implication of this study is also constrained by specific context in this study. Because case companies are from emerging market, when assessing the applicability of research conclusions, practitioners should take contextual social, cultural and economic environments into consideration. As my study shows that only one business owner has intentionally adopted service-oriented business plan, and the other two sample firms essentially are market-follower. Therefore, conflicts of opinion exist commonly in every sample firms. Moreover, sample firms in this study are all SMEs so that every interviewee may bear certain constraints in the first place when they answer interview questions. Therefore, the information summarized from interview data may not be able to represent the general industry. Finally, due to the limited time and resources the empirical study was conducted in tight schedule with the absence of in-depth idea exchange the conclusion may appear superficial.

Future study could further extent the dimensions both horizontally and vertically. Horizontally, future study can choose bigger sample size and investigate more capability developing mechanisms to enhance the generalizability of study. Vertically, future study could include longitudinal data as well as more quantified measures to see how data will

change along with the progress of strategy implementation. Additionally, future study could consider more applicable measures for service quality and service performance so that the conclusion will have better managerial implication. Finally, future study could consider other influential factors in relation with capabilities development, for example mega trends of technology development or macro conditions of external environment.

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Appendix

Appendix 1: Interview Question to CEOs

Date:

Place:

Name:

Title:

Years with the company:

Pre-interview about firm background:

1. When was the firm built? How long has it provided integrated solution?
2. How much is the annual sales volume? How much is the value of every project averagely?
3. Are all sales come from project-based business? If not, then how much is the percentage of sales from project-based business?
4. How many projects are going on at moment?
5. How many project managers firm has?
6. How long work experience a project manager/team member usually has?
7. Are all project managers come from firm internally? How do you think about the difference between from inside and outside? In what situation firm will prefer to recruit project manager from outside or from M&A?
8. Are all project team members come from firm internally? How do you think about the difference between from inside and outside? In what situation firm will prefer to recruit team members from outside or from M&A?
9. How do you describe the project process for solution business?
10. When will the project team be organized?
11. How many functional units a project team usually need?
12. What are criteria to judge a project executed successfully or not?
13. To what extent can project team affect the performance of the project?
Specifically, what aspects the project manager can affect positively? And, what aspects can project team members affect positively?
14. How does firm evaluate individual's qualification when project teams are organized?
15. What kind of training program firm has at moment for project members?
16. How do you think about the importance of employees' technical background and commercial background? What kind of training program firm has in place to develop and balance these knowledge and skills?
17. How do you think about the relationship between product-centric and customer-centric attitude in project execution? How are customer-centric knowledge and skills developed by/for project manager and team members at moment?
18. How do you think about team members' multifunctional work experience? What kind of policies are in place to encourage this?
19. What kind of motivation policies firm has for project team members?
20. What kind of management systems are in use in project teams? How do you think about the importance?

Appendix 2: Interview Question to Project Manager & Team Members

Date:

Place:

Name:

Title:

Years with the company:

Questions about project:

1. How long will the project you are involved in now last?
2. How many functional units/team members this project team has?
3. How many similar projects you ever worked for in this company?

Questions about roles the project manager or team members play:

4. How do you usually do if you need to report to or ask information from manager?
5. How often do you need to make work-related decision by yourself? What kind of decisions they are?
6. Do you think it is normal to make those decisions by yourself? Why do you choose to make decision by yourself instead of waiting for manager's instruction?
7. What kind of efforts have you ever tried to make sure your decisions are correct?
8. How can you take responsibility for your decision-making?
9. How can you make sure that your decisions are correct?

Questions about every actor's capabilities and how to develop such capabilities:

10. Who are your counterparts on customer side? How you develop interaction with them?
11. How do you evaluate your cooperation with your counterparts on customer side?
What are the benefits you can expect from good interaction with your counterparts?
12. What kind of service you are expected to provide to customer in current project?
How does customer evaluate your service? What kind of efforts you ever tried to improve your service?
13. What kind of education background team member at your position usually has?
What kind of qualities you think are most important for this position?
14. What kind of education background project manager usually has? What kind of qualities you think are most important for project manager?
15. How do you perceive the importance of knowing what colleagues are working on and how are the situations? How can you access knowledge and information about this project?
16. Are you a multitalented employee? Do you think multitalented employees are more valuable for project execution?
If yes, then what kind of roles you think demand multitalented employees the most?
How to develop required capabilities?
17. How do you think about the relationship between customer-centric and standard product-centric attitude in project execution?
18. What kind of occupational training team members usually have? How often?
19. Please recall several examples in which project manager's misconducts caused problems. What lessons you have learnt? What will you do next time?
20. Please recall several examples in which misconducts by team member caused problems. What lessons you have learnt? What will you do next time?