

Knowledge and innovation in service firms: a conceptual framework

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ABSTRACT

This paper offers a critical review of relevant literature in the area of knowledge management and service innovation and suggests why previous strategy models fail to explain the relationship between knowledge resource and innovation in service firms and what the drivers of service innovation are. In service businesses, the service offering is often referred to as 'service packages' or 'customer solutions,' and relates to the process of customising product to meet customer-set specifications. Innovation and added values in service firms seems to have a closer relationship with the combination and recombination practices carried out by entities such as project teams particularly in matrix management firms. It is suggested that the firm's codified, rather than tacit, forms of knowledge – particularly the firm-wide production systems – can lead to various types of (re)combination. Based on the resource-based view of the firm, a study of production systems and resource recombination can provide better insights about the linkage between innovation, added value, and knowledge resource in the service industry.

Keywords: Business innovation, Knowledge management strategy, Knowledge-based view of the firm, Resource-based view of the firm,

1. INTRODUCTION

Knowledge, both codified and tacit, has been described as a firm's key strategic resources for generating innovation and competitive advantage (e.g. Amit and Schoemaker, 1993; Teece et al., 1997). However, in a number of knowledge management studies the concept of tacit knowledge (Polanyi, 1966) has been used to describe many and varied phenomena so much so that Donaldson claims it has led to the "mystification and magnification" with tacit knowledge being the cause of most if not all the positive attributes of a given firm (Donaldson, 2001). Often, tacit knowledge was described as an extremely valuable source of innovation, creativity, idea generation, and as a spiritually active and forward-looking ingredient (e.g. Hansen, et al., 1999). Conversely, codified knowledge has been treated as static, cold, inactive, and less innovative which inevitably directs management thinking towards cost-cutting as the only viable survival strategy.

It has long been recognised that there is a close association between investment in the firm's research and development (R&D) and levels of innovation. From a classical economics standpoint, innovation while characteristically radical, disruptive, is often closely linked to breakthroughs and scientific discoveries and inventions (e.g. Burn and Stalker, 1961). In this way, many scholars argue that the likely outcomes of innovation are new products and services and novel solutions (Armbrecht et al., 2001). In general, most highlight the role of bright scientists, graduates from prestigious schools, and highly experienced professionals as crucial resources for the generation and maintenance of the firm's tacit knowledge.

In service businesses, however, innovations are more likely to be generated in the forms of combination and recombination of existing components into new service bundles (Sundbo, 1998; Penrose, 1959; Henderson and Clark, 1990; Kogut and Zander, 1992; Grant, 1996; Galunic and Rodan, 1998). This is highly applicable to the notion of 'incremental innovation' in that this bundling or blending of services may not be radically innovative yet innovations do occur over time. This incremental style innovation is frequently neglected by the traditional strategic models yet it is possible to argue that a key source of innovation in service firms may depend on the codified forms of knowledge and practices (i.e. standard procedures, systems, protocols, instructions, formulas). This is particularly because of the high detectability and easiness-to-share, a recombinable/reconfigurable nature of that which is explicit (e.g. Galunic and Rodan. 1998).

Given the importance of knowledge resource in the service sector – especially the extent to which it has contributed to the growth of the knowledge-intensive service firms, this paper addresses the important role of codified knowledge and practices in the production of services offerings. First, the paper examined the current position of codified knowledge in existing knowledge management literature and argues why previous knowledge strategies are not suitable for studying knowledge management in knowledge-intensive service business. Second, based on resource-based view conceptual framework, the paper has contributed to the literature by emphasising the important role of codified knowledge in the production system. It also discusses for a more expansive definition of what constitutes basic knowledge components needed in the production system and its relationship with (re)combination of resources. Third, the paper proposes some hypotheses regarding the relationship between knowledge components in the production system and (re)combination practices. Then, research methods have been briefly discussed follows by the conclusion.

2. THEORETICAL BACKGROUND

Customer values, knowledge, and traditional strategies

Traditionally, it was believed that customers judged the ‘value’ of a product (or service) on the basis of some combination of quality and price (Treacy and Wierseman, 1993). This suggests that firms will be able to compete in the marketplace based on Porter’s (1985) two classical competitive strategies: differentiation or cost-leadership. By differentiation, scholars generally mean offering the market a superior quality and leading edge product or service that makes rival’s goods obsolete. By cost-leadership, scholars usually mean a strategy of providing customers with reliable products and services at competitive prices. Many academics agree that Porter’s competitive concept creates ‘value’ as a result of strategic reaction to environmental uncertainty: a low-cost strategy allows firms to earn profit during times of heavy competition; a differentiation strategy creates unique product features and strong brand-image and this leads to customer loyalty.

From this traditional view, a firm’s value is created through a series of value-adding activities. This series of activities has been referred to as the ‘value chain’ model (Porter, 1985), which connects raw materials, inbound logistics, and production processes with outbound logistics, marketing, and sales. The common outputs of this value chain are physical products while the common resources are physical assets such as land, factory, machinery, labour, and capital

(Rayport and Sviokla, 1999). In this value chain, some have observed that knowledge becomes totally invisible to customers (Normann and Ramirez 1994). According to this traditional view, marketing and research & development (R&D) is less critical to organisational success compared to production and engineering (e.g. Taylor, 1913; Miles and Snow, 1978).

Therefore, during the 1980s a number of strategy studies advocated Porter's competitive model, which was heavily based on an industrial economic theory – for instance, Miles and Snow's (1978) concept of the (innovative) prospector, Miller and Friesen's (1982) entrepreneurial strategy, and Nelson and Winter's (1982) evolutionary economics. These studies emphasise the application of strategy in relation to the organisational externalities or, in other words, the industrial economic environment. Similar to Porter, these organisational strategists assumed that the success of knowledge strategies is primarily dependent on how well strategies can competitively and economically cope with the industrial environment – whether it is uncertain or stable.

Existing knowledge management strategies framework

Rather than offering a more critical and constructive model, recent knowledge management research, which primarily emerged in the 1990s, displayed a simple continuation of an industrial economic model. To name but a few, this includes the studies conducted by Sveiby (1997), Schulz and Jobe (1998), Poynder (1998), Hansen, et al. (1999), Mentzas, et al. (2001). Simply, most of the previous research in knowledge management has provided a clear picture of contrasting nature of knowledge management (KM) strategy following two different strands of industrial-based economic value models (see Table 1).

Strategic orientations such as cost leader, defender, conservator, information-focused, knowledge codifier, people-to-document locate on the same strand, emphasizing economic of reuse and efficiency, and reliability of products. A differentiator, prospector, entrepreneur, human-focused, person-centred, and personalization are on the other, focusing superior value creation and innovation. Table 1 presents the cluster of strategic characteristics found in literature in the 1980s and the 1990s. Each strand shares common characteristics, particularly in relation to the industrial-based economic value models that were again heavily influenced by different levels of environmental uncertainties; uncertainties resulted from the interplay between industrial players – suppliers, customers, competitors, and so on.

There are implications that two strategies represent the different performance drivers: low-cost, efficiency, reliability strategies consider 'codified knowledge' as the main driver; differentiation, innovative, and value-added strategies particularly concentrate on managing 'tacit knowledge.' More importantly, since different strategies have different competitive advantages, strategy theorists suggested that for a firm to be successful, it has to implement only one predominant strategy that fits its circumstances. For example, cost leadership or differentiation, defender or prospector, information-focused or human-focused, codification or personalization. Hansen, et al. (1999) claimed that a firm that tries to excel at both approaches at the same time is at risk of failing in both. Porter (1985) believed that his competitive strategies are so robust that a firm has to be either a cost leader or a product differentiator, or otherwise a failure in the market.

Problems with existing knowledge management studies

It can be assumed that, since a number of knowledge studies were influenced by the tenets of classical economics, these studies did not move knowledge and strategy research forward. Knowledge is portrayed in these earlier studies as being easily divided into tacit and codified and that firms tended to manage one type of knowledge against the other. Two approaches are common in much of the literature: a romantic interpretation of the power of tacit knowledge and a view that knowledge is unique, difficult to imitate, difficult to substitute and difficult to transfer.

First, past studies are prone to over-use of the concept of 'tacit knowledge' labelling a wide variety of phenomena as evidence of tacit knowledge (Donaldson, 2001). Conversely, the notion of codified knowledge was over-simplified as the equivalent to information or even information technology, or computer-generated knowledge. In the bulk of this literature a clear preference for tacit over codified knowledge is evident (e.g. Barlett and Ghoshal, 1997). Experiences, talents, skills, and expertises can be examples of knowledge that are highly tacit and ephemeral; a firm that boasts such an individual with such elusive talents on their payroll is to feel privileged. Thus tacit knowledge is elevated to great importance while codified knowledge remains the much poorer cousin of tacit knowledge. Codified forms of knowledge are described as passive, low-valued, and less innovative. In this way, there has been much exaggeration about the powers of tacit knowledge to the extent that it becomes practically equated with the ability to innovate, and be creative and pro-active. Donaldson (2001) believes that this overemphasizing of the positive properties of tacit knowledge is simply a romantic reaction against the trend to increasing Weberian formal rationality.

Second, a number of knowledge-intensive studies that glorify tacit knowledge believe that such forms of knowledge possess sustainable competitive advantage qualities – unique, difficult to imitate, difficult to substitute and difficult to transfer (e.g. Barney, 1991). Hence, the access to this superior ‘stock’ of knowledge is crucial for competitive market positioning (e.g. Dierickx and Cool, 1989; Spender, 1996; Tsoukas, 1996; Morris, 2001). In contrast, codified forms of knowledge, without any of such qualities, become less favourable and are treated under the umbrella of information technology (IT) and not of the management. Consistent with its origins in the economics literature, this extreme perspective adopted a positivistic view of knowledge and treated tacit knowledge as an objectively definable commodity that can be traded or secured between individual units or firms (e.g. a headhunter) (Lowendahl, et al., 2001)¹. Since other types of resources are more easily tradable in markets, compared to tacit knowledge they are a lot less likely to constitute sources of sustainable advantage (Amit and Schoemaker, 1993).

By integrating the ideas that tacit knowledge is difficult-to-be-imitated resource and that its development is against the old-style formalisation, past research provided the image of tacit knowledge as the source of innovativeness and value creation within the firm. At the same time, previous studies painted a picture where codified knowledge rarely drove innovation, which in effect neglected the fact that throughout history codified forms of knowledge have contributed significantly to the growth of scientific knowledge and human civilisation. The simplest form of codified knowledge is writing, of which has been proclaimed as the most exquisite intellectual accomplishment of human (Claiborne 1990). It is also the most important tool for human advancement, making it possible for each generation to build upon the work of the previous, to transmit knowledge from person to person, across cultures and time (Norman 2006). From 1632’s Galileo’s principle of relativity and 1904’s Lorentz Contractions to become 1905’s Einstein’s Special Theory of Relativity is one of many examples of how the codified knowledge is evolved across time and places (Taylor & Wheeler 1992; van Helden 1999).

¹ Within the resource-based view of the firm (RBV), Lowendahl, et al., (2001) offered that at least two different main streams of research are found: 1) research which emphasises the stock of knowledge – a more traditional view largely influenced by its industrial economic-based origin; and, 2) research which emphasises the way the knowledge is applied in value creation processes.

Table 1: Two modes of organisational and knowledge-intensive strategies – industrial economic value models

Authors	1. Economic model: low-cost & reliable KM	2. Economic model: innovativeness, superior & value-added KM
Hall (1993)	People Independent	People Dependent
Porter (1987)	Cost leadership strategy: cutting costs, emphasising efficiency, and offering competitive price for products and services	Product differentiation strategy: high R&D investment, offering leading-edge product and services with premium price, and maintaining customer loyalty
Miller & Friesen (1982)	Conservative strategy: hesitant to be future-oriented	Entrepreneurial strategy: more aggressive and forward-looking in the market
Miles & Snow (1982)	Defender strategy: emphasising problem-solving (corrective), reacting to environment, and inhibiting new product development	Prospector strategy: problem-seeking (prevention) and encouraging innovations through decentralization for coordination and flexible organisational structure
Bartlett & Ghoshal (1997)	N/A	Person-centered strategy: knowledge and individual cannot be separated from each other.
Sveiby (1997)	Information-focused strategy: low degree of customisation, knowledge sold as objectives, increasing return from efficiency, high investment in IT, and people are seen as cost	Knowledge-focused strategy: high degree of customisation, knowledge sold as process and increasing returns from effectiveness, high investment in people/medium in IT, and people are seen as revenue
Poynder (1998)	Information technology-focused strategy: networks of computer and GroupWare are the keys of a successful organisation	Human-focussed strategy: focusing organisational culture
Schulz & Jobe (1998)	Codified strategy: codifying, storing, and making knowledge explicit is the most important task as knowledge can be reused and reliable	Tacitness strategy: maintaining knowledge in the tacit format makes it rare and inimitable – or value-added, emphasizing on sharing through social interaction (tacit-to-tacit)
Mentzas, et al. (2001)	Product-focused strategy: knowledge is documented: their creation, storage and reuse in computer-based corporate memories. The strategy treats knowledge as “it” which is an entity separate from the people who create and use it.	Process-focused strategy: knowledge is a social process. It emphasises the importance of tacit knowledge that exist in people, or networks of people, that collaborate and socialize within or even outside the business environment. The underlying strategy here is to facilitate connections between those people who possess and those who need knowledge.
Hansen, et al. (1999)	Codification strategy or people-to-document strategy: a firm will benefit from <i>efficient</i> reuse of knowledge. It focuses on codifying and storing knowledge in database. Employees will search the electronic knowledge repository for relevant knowledge and previously developed solution without spending time tracking down and talking with people.	Personalisation strategy or person-to-person approach: this strategy allows firm to benefit from <i>effective</i> person-to-person knowledge sharing and high degree of customisation. It focuses on deep and rich knowledge that is tied to the person who developed it.

3. KNOWLEDGE IN THE PRODUCTION OF SERVICES

Resource based view (RBV) of the firm and the service value

While classical competitive strategies are based on external economic environments, other strategy theorists offered that organisational competitive advantages could come from within the firm – no matter what type of an external environment a firm was situated in. From this idea, the resource-based view of the firm (RBV) emerged in the mid-1980s, following by the knowledge-based view (KBV) concepts (e.g. Rumelt, 1984; Wenerfelt, 1984; Barney, 1991; Amit and Shoemaker, 1993). This generated substantial interest in the role of internal knowledge resources, especially the firm's capability, in development of competitive advantages. One of the main arguments from RBV and KBV literature is that 'practical knowledge', or 'know-how', is the main potential source of innovation and value creation (e.g. Leonard-Barton, 1995; Leonard and Sensiper, 1998; Teece, 1998). By applying service know-how creatively, service organisations can generate customer intangible value, or 'service value', extending from the traditional manufacturing value models which primary focus on either 'differentiation' or 'low cost'.

The notion of 'service value' can be portrayed under various concepts, for instance, 'customer intimacy' (Treacy and Wiersema, 1993; Treacy and Wiersema, 1995), 'customer relationship', relational resources (Gabarro, 1978; Galuti, 1995), relational capital (Sveiby, 1997), or even the notion of social capital (Tsai and Ghoshal, 1998). Organisations that emphasise these customer-oriented strategies heavily invest on developing a close relationship with their customers. While service value can come in various forms such as convenience of purchase, after-sales service, and reliability, one of the most well-known approaches is 'customisation of service solutions'. This is a process where service providers combine and recombine service components to create customised offerings in an attempt to meet what customers have requested.

Codified forms of service production

Hence, according to RBV and service value concept, it is not mainly the 'quality of stock' of resources that give the service firm a business advantage, but rather the firm's 'ability to produce services' through which the firm's knowledge resources or components are (re)combined to create service values. Although it may involve with some forms of tacit

knowledge, such as skills and experiences of individuals, ability to produce (or production know-how) is likely to be codified at the firm level; it primarily involves the information, formula, or recipe about performance of specific solutions to problems that may or will recur in the future (Ferdows 2006; Lee & Van den Steen 2007). Codified forms of service production may include, for example, the firm-wide practices, procedures, systems, or protocols about how various knowledge components are successfully related that can result in different forms of (re)combinations (see Figure 1). Over time, while individuals who are working in the production systems and their personal skills are easily subject to changes and can be unstable, like moving to another unit or resigning from the company, codified production systems are a lot more robust.

The concept of knowledge in service production is consistent with Kogut and Zander's (1996, p. 503) which suggests the firm is 'a social community specialising in the speed and efficiency in the process of creation and transfer of knowledge.' From this perspective, the practices directly involve the approaches in which the more tangible input resources, such as people, machinery, financial capital, are manipulated and transformed to add value (Teece et al., 1997, p. 509).

Knowledge resource (re)combinations

Within a service environment, 'innovation' is understood to mean delivering service to customers in a different way by using different service strategies, resources and materials. From this point, the more pragmatic view of innovation in service firms arrives. Innovation is thus no longer about radical, relatively large outcomes and visible things like a new product, but much more about incremental, adjustment, and continuous improvement. Galunic and Rodan (1998) use the term 'resource recombination' to explain this possible source of this innovation and value creation; Penrose (1959, p. 25) also pointed:

“...exactly the same resource when used for *different purposes or in different ways and in combination with different types or amounts of other resources* provides a different service or ser of services.”

The studies by Schumpeter (1934), in particular, emphasizes this source of innovation:

“To produce means to combine materials and forces within our reach...to produce other things...means to combine these materials and forces differently.” (1934, p. 65)

By this, Schumpeter was saying that sometimes innovation ‘consists to a substantial extent of a *recombination* of conceptual and physical materials that were previously in existence’ (Nelson and Winter, 1982, p. 30). Similarly, Grant (1996) supported that the purpose of the firm is in integrating, bringing together diverse basic inputs and specialised areas of knowledge and bundling them to perform a productive task. Hence, a firm is full of such ‘clusters’ of input (machinery, computer, systems, infrastructure) and knowledge-based resources. Such clusters of resources are consistent with what many have referred to as ‘capabilities or competencies of the firm’ (e.g., Prahalad and Hamel, 1990; Leonard-Barton, 1992; Barney and Zajac, 1994; Teece, et al., 1997).

4. HYPOTHESES

According to Penrose (1959) and Schumpeter (1934), (re)combination practices are the result of the way firm’s production systems organise its knowledge resource components via combining and recombining of those components. As described in the previous section, knowledge to combine and recombine can be called “production know-how” or “production system” which is the way different knowledge resources are practised to create the customer solutions in service firms.

According to model that focuses on the relationship between technical and applied knowledge in the production of packaged solutions – a model I refer to as “the production system model”, different forms of (re)combination are the result of different relationship between two knowledge components – functional (core knowledge) and integrative knowledge (e.g. Henderson and Clark, 1990; Iansiti and Clark, 1994; Verona, 1999).

According to knowledge in the production system model, existing knowledge resource can be made up of functional and integrative parts. The former involves a deep technical knowledge or what Henderson and Clark (1990) have called ‘component knowledge’ or ‘core knowledge’ (Helfat and Raubitschek, 2000). In service businesses, such knowledge ingredients can be seen in the forms of technical expertise. The latter acts as an adhesive ingredient by blending the different functional competencies developed by the firm. Different terms are used to define integrative knowledge (e.g. Cohen and Levinthal, 1990; Grant, 1996; Henderson and Clark, 1990; Kogut and Zander, 1992) such as ‘architectural knowledge’ (Henderson and Clark, 1990), ‘applied knowledge’, or ‘core design concept’ in product development literature (Abernathy and Clark, 1985), which basically is knowledge about understanding overall products and services. According to Cohen and Levinthal (1990), both

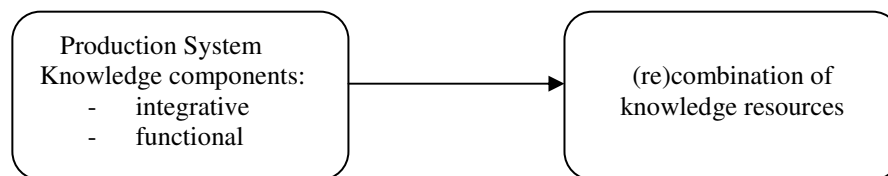
integrative knowledge and functional knowledge are highly significant because they are necessary ingredients for transformation and exploitation of existing knowledge resources, in other words, for making a ‘realised’ knowledge capacity (e.g. Zahra and George, 2002). Hence, it can be said that there is the relationship between system knowledge (technical and integrative knowledge) and its likelihood of (re)combination of resources (Figure 1) and:

Hypothesis 1: The knowledge in the production system model of the firm will be positively related to the extent of (re)combination practices of knowledge intensive resources

Hypothesis 1A: The functional knowledge resources within the production system will be positively related to the extent of (re)combination practices of knowledge intensive resources

Hypothesis 1B: The integrative knowledge resources within the production system will be positively related to the extent of (re)combination practices of knowledge intensive resources

Figure 1: Relationship between the knowledge in production system and (re)combination of knowledge resources



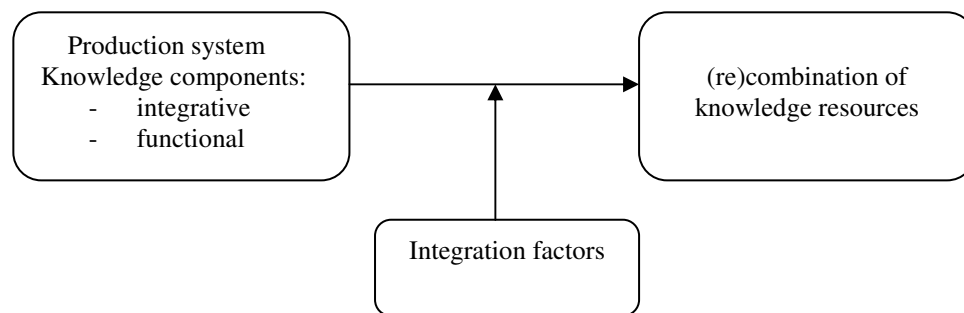
Integration factors: trust, shared cognition, and mutual benefit

To exploit knowledge in service businesses, firms need to share relevant knowledge among its members in order to promote mutual understanding and comprehension. The key problem of knowledge (re)combination practices comes from the fact that integrative elements and functional elements are highly different in many ways, such as context, content, etc. This can also result in the discrepancies between perceived importance of each type of knowledge by people who hold or are responsible for those knowledge areas. This paper argues that reconciliations of these differences are likely to help promote more efficient and value generating integration and recombination practices. The successful recombination is thus

arguably strongly dependent on the relationship between integration and functional knowledge components. Strong integration factors such as shared cognition, trust, mutual benefits between people who are in charge of integrative knowledge and people who are responsible for functional knowledge are expected to deliver better recombination practices. Hence, degree of trust, shared mentality, and availability of mutual benefits are forms of social integration (Zahra and George, 2002) that can promote or prohibit the recombination of various knowledge resources. Therefore:

Hypothesis 2: The social integration factors, such as shared mentality, availability of mutual benefits, and degree of trust within the team will moderate the relationship between knowledge resources in production system and (re)combination practices

Figure 2: Relationship between system knowledge, (re)combination of knowledge resources, and social integration factors



5. RESEARCH STRATEGIES

Given the limited theory and empirical research on this topic, this study will use an inductive, multiple-case design to examine the knowledge production system during the creation of customer solutions of the firms. This methodology will allow a replication logic, in which a series of case studies are treated as a series of experiments, with each case serving to confirm or disconfirm the inferences from the others (Yin 1989). In addition, the study will focus on multiple levels of analysis: individuals who involve during the production of service, service/project teams, and business units within corporation. While complex, this design will facilitate a richer and more reliable process of inductive theory building than a single-level design (Yin, 1989).

As is in typical inductive research, I will analyse the data by first building individual case studies and then comparing within and across cases to construct a conceptual framework

(Eisenhardt, 1981). Upon completion of all the interviews for a particular team and firm, the interview summaries and transcripts, along with the supplementary data, will be synthesised into a case study that includes different recombination styles that are explored in each team and company. Each case study began with the background of the firm, its business model, its organizational structures and the product/market contexts in which it competes. This was followed by a description of the organizational arrangement, internal environment, and relationship between project managers and team members. Finally, detailed stories of the types of recombination are developed.

The cases will be used for two types of analysis: within-case and cross-case analysis (Miles & Huberman, 1984). Within-case analysis focuses on describing events experienced during the service solution production among teams, and then developing generalisable constructs (recombination and the relationships between knowledge components). Cross-case analysis looks for the presence of such constructs and relationships among constructs across multiple cases and examined whether similar themes emerged in multiple settings (Eisenhardt, 1989c: Miles and Huberman, 1984). I will further compare successive cases for similarities and differences to develop the emerging constructs.

Within each project team, first, the degree of involvement and roles of integrative knowledge resources, such as project managers, team managers, or senior managers will be examined in relation to the degree of involvement and roles of technical knowledge resources, such as technical staff and consultants. Various relationships between two different types of knowledge resources are expected to result in different forms of (re)combination which expected to achieve different added values. Then, different styles of resources (re)combination during the production of customer solutions will be examined to define the relationship, or lack of it, with the knowledge resources and production systems. (Re)combination practices are defined as a combination and recombination of different available resources that can generate the firm's value-added via various forms: a new combination (to create novel solutions), (re)combination via sharing related resources (to save the costs and create economies of scope), (re)combination via reusing existing same resources (to create economies of scales), and any mixing of such approaches.

6. CONCLUSION

Focusing on the resource recombination within service firms, the paper proffers some hypotheses relating to the nature of knowledge and (re)combination of resources within service firms. These hypotheses seek to guide management in what are some key impediments or issues to consider when attempt to secure innovative outcomes. They should also help strategic management scholars to build better frameworks and models to assist managers to implement or further operationalise knowledge management in the service business.

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