

## Service development success: a contingent approach by knowledge strategy

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**SERVICE PRODUCT DEVELOPMENT:  
A CONTINGENT APPROACH BY KNOWLEDGE STRATEGY**

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# **SERVICE DEVELOPMENT SUCCESS: A CONTINGENT APPROACH BY KNOWLEDGE STRATEGY**

## **ABSTRACT**

**Purpose:** Contingency theory suggests that effective strategies and structures are not universal but dependant upon situational factors. This paper explores how the way service firms compete acts as a strategic contingency moderating the effect of a new service development (NSD) system on innovation performance. Two knowledge-based strategies are tested as contingency factors. One strategy adds value for customers via the delivery of personalized knowledge-based services; the other strategy adds value by services exploiting codified knowledge.

**Design:** A sample of 70 large service enterprises is used to test a contingency model of service innovation. The NSD system is a synergistic meld of basic building blocks of NSD systems: *people* organized cross-functionally, the discipline of formal *processes* for guiding development activities, and the deployment of enabling *tools/technologies*. Regression analysis is used to test the relative impact of these three elements on innovation performance contingent on the type of knowledge strategy employed.

**Findings:** While each element of the NSD system has an effect on performance, the optimal design is contingent on the strategy the firm employs. If firms enact a personalization strategy, NSD systems that score high in the deployment of cross-functional organization and disciplined processes are higher performers. If firms emphasize a codification strategy, NSD systems that score high in the deployment of tools/technologies are higher performers. Combinations of the two kinds of strategy permit the construction of a four-cell classification of service firms. This typology is used to further explore the implications for how managers design NSD systems to optimize performance

**Originality:** This paper uses a contingency approach to demonstrate that an optimal NSD system is dependent upon the type of knowledge strategy firms deploy. The impact on performance of three components of NSD depends on the degree of either codification and/or personalization in the service offering. A novel approach based on the knowledge management literature is employed creating a typology of service firm strategies. This is the first time such a typology has been postulated.

**Keywords:** service development, knowledge management, service type

**Paper Type:** research paper

# **SERVICE DEVELOPMENT SUCCESS:**

## **A CONTINGENT APPROACH BY KNOWLEDGE STRATEGY**

### **INTRODUCTION**

New service development (NSD) remains among the least studied and understood topics in both the service management (Menor and Roth, 2007) and the innovation literatures (Page and Schirr, 2008). Both sets of literature call for further conceptual work and empirical research in an effort to understand the unique characteristics of NSD and to “discredit the belief that new services happen as a result of intuition, flair, and luck” (Menor, Tatikonda and Sampson, 2002 p136). The aim of this research is to contribute to the emerging literature on how NSD system design influences innovation performance in service firms.

It is widely recognized that all services are not the same. For example they vary considerable in terms of the nature of the service act and on the degree of interaction between the service organization and the customers. However to date there has been little attempt to investigate differences in development approaches among types of services (John and Storey, 1998). Yet leading researchers argue that differences among services warrant further research (Lovelock and Gummensson, 2004).

Because the diversity of service offerings is poorly understood, it has proved difficult to identify general principles for managing operations and marketing practices across different service firms (Chase and Apte, 2007). One solution offered by Menor, Roth and Mason (2001) is the application of contingency theory. Contingency theories test how variation in system capabilities differentiates performance outcomes depending on situational factors. For example, it has been found that a more cross-functional approach to product development is needed under conditions of uncertainty (Olson, Walker and Ruekert, 1995). This contingency approach closes a gap in the product development literature that Barczak et al. (2009) characterize as the failure of a ‘one size fits all approach to innovation.’

Lack of understanding of contingency factors may be a reason why recent research on service innovation competence yielded inconclusive findings regarding the importance of particular development factors and their relationship with NSD performance (Menor and Roth, 2007). Goldstein et al. (2002) postulate that a major deficiency in the NSD literature is a lack of research linking business strategy and service development. Strategy has been found to be an important moderator of the link between marketing capabilities and performance (Olson, Slater and Hult, 2005). Chase and Apte (2007) suggest that classifications of the strategy deployed and the nature of the service rendered could help provide operationally useful rules for new service design. This approach builds on strategic choice theory that envisions a deliberate role for managers in making decisions with critical impacts on performance (Child, 1997).

This paper investigates whether the effectiveness of a NSD system is contingent upon the strategies the service firm employs. We marry existing theories of knowledge-based strategies with a proven model of product development to test a contingency approach to NSD effectiveness. This contingency model is tested using a sample of large service enterprises in the New York City metropolitan area. We also provide managers with advice as to how service development processes and practices can be optimally deployed.

### **SERVICE STRATEGIES**

The strategy for a service firm accounts for not only its mission and long-term objectives, but also how it delivers value to its customers in comparison to other firms in the marketplace (Goldstein et al., 2002). Generic strategies have been identified that transcend traditional industry classifications (Zahra and Pearce, 1990) and may prove a fruitful way of dealing with the diversity in services. However there is little guidance as to the most appropriate dimensions on which to measure strategy. Roth and Menor (2003) argue that services theory needs to take a knowledge management perspective as knowledge is considered the most important resource that a firm can control. Knowledge competencies are the main determinants of superior performance as they are rare, valuable, and difficult to imitate leading to a sustained competitive advantage (Barney 1991; Grant 1996). It is firm's knowledge competencies that provide value to its customers (Day and Wensley, 1988). Therefore this paper explores how knowledge resources enable firms to offer different kinds of service offerings and strategically differentiate themselves from competitors.

A study of knowledge management strategies in service companies argues that organizations employ either a *codification* strategy based on explicit knowledge or a *personalization* strategy based on tacit knowledge (Hansen, Nohria and Tierney, 1999). Explicit knowledge is codifiable and transmittable in formal, systematic language. Tacit knowledge is hard to articulate, is acquired and stored within individuals and needs to be learnt through practical experience (Szulanski, 1996).

#### *Personalization Strategy*

A personalization strategy involves the sharing of tacit knowledge through direct person-to-person contacts. Many services require an interaction between the service provider and the customer; and in some circumstances interaction amongst customers as well. Sometimes the service product is essentially its delivery process. This is especially true when the customer is the direct recipient of the service, often undergoing transformation during the transaction, e.g. education, psychiatry, hairdressing. One of the difficulties of competing on tacit knowledge is that quality is reliant on human idiosyncrasies. Quality is more uncertain and often cannot be objectively judged. Therefore the risk to the customer is higher and features such as service guarantees become critical in providing value to customers (Liden and Sanden, 2004).

Tacit knowledge is more effectively employed when services need to be adapted to unique customer needs for example to solve unique problems of customers when no standard solutions are available (Salmi et al. 2007). For services that involve judgmental decisions by the service provider the main factors behind new service success is the quality of the service experience and the expertise of front-line staff (e.g. Storey and Easingwood, 1998; Roth and Menor 2003). Customers and staff come together in a socialization process where tacit knowledge is combined in new and different ways to create shared meanings (Nonaka, 1994). This mixing of tacit knowledge often includes subtle qualities like trust that are hard to measure. An advantage of competing on tacit knowledge is that it is harder to copy by competition because of "sticky information," i.e., information that is costly to acquire, transfer and use in a new location (Von Hippel, 1994). Organizations competing on the basis of tacit knowledge are able to win in the marketplace by service offerings providing knowledge-based solutions tailored to the needs of diverse customers.

#### *Codification Strategy*

Firm's adopting a codification strategy typically makes tacit knowledge more "explicit." Codification translates knowledge into externalized forms that can be readily used by others.

It is a “people-to-docs” approach where knowledge is codified and stored in databases. This is suitable for a production or standardization approach where “economies of reuse” occur so that knowledge is not created unnecessarily. This is more than simply storing knowledge in databases, documents and the like. It is embodiment of tacit knowledge into processes, routines, and procedures (Grant, 1996). Organizations that have high levels of explicit knowledge create value by codifying and building this knowledge into technical and service systems that are often automated. Professional service firms have been found to employ an explicit knowledge strategy where knowledge is pigeon-holed into applications in conformance with pre-defined operating procedures, e.g., accountancy standards, medical care, legal precedents, etc. (Mintzberg and Quinn, 1996). Similarly some advertising firms use internet software to standardize webpage production for customers (Salmi et al. 2007).

Many firms competing on explicit knowledge are key players in the information economy. Often firms will directly sell their knowledge base e.g. information and research services. Firms may also embody their knowledge in hardware and software. For example IT services typically include buying a mix of product and service activities (Salmi et al., 2007). It has long been recognized that IT/IS can give service firms a competitive advantage by lowering costs and/or enhancing differentiation (Bharadwaj Varadarajan and Fahy, 1993). Knowledge capabilities embedded in both hardware and software is also required to deliver a seamless communication experience via multiple customer “touch-points.” Similarly self-service technologies are being introduced by service firms to add value via enhanced customer service, enabling direct transactions and/or customer self-learning (Bitner, Ostrom and Meuter, 2002). Codification enables the standardization of service design and delivery. It makes growth simpler, reduces costs and makes quality management easier. Service firms competing with a codification strategy are able to win in the marketplace because of superior capability for delivering knowledge-based solutions in a relatively standardized, easy to consume format.

Either knowledge strategy may offer service firms a positional advantage having a direct impact on the service concept and value proposition offered to customers. Roth and Menor (2003) argue different service concepts require different approaches to their design and management. Therefore we propose that effective NSD practices are contingent on the firm’s knowledge strategy.

## **A CONTINGENT MODEL OF NSD**

The emerging work on new service success has covered a wide range of practices, resources and routines (Johne and Storey, 1998; Menor and Roth, 2007). Three sets of practice have been identified as being key elements of an effective NSD system - the management of people via an organic team structure, the discipline of formal process controls for guiding development activities, and the deployment of enabling information technology tools. Several studies of best practices not only in goods (Hull, Collins and Liker, 1996; Susman and Dean, 2002; Gerwin, 2002), but also of services (Froehle et al., 2000; Tidd and Hull, 2003) have focused on these three components of product development systems. However there is still uncertainty as to the relative importance of each element and how to manage their interrelationships (Menor and Roth, 2008).

Contingency theory suggests that the greater the fit between strategy and structure, the higher the level of performance. This paper proposes a model suggesting that the contribution of each element of the NSD system to innovation performance may vary depending upon the nature of the strategy employed i.e. a personalization strategy or a codification strategy. This

contingency model is illustrated in Figure 1.

[Insert Figure 1 here]

### **Organic team structure**

The primary factor in the development of successful new services is the creation of an innovative environment where ideas and open communication are encouraged by supportive management (de Brentani, 1993). An organic team structure (OTS) empowers people from diverse functions with responsibility for executing specific service development projects. OTS is characterized by open communication which helps cross-fertilize ideas and stimulates creative solutions to complex problems. Research in the service sector stresses the importance of involving and empowering front-line staff throughout the development process (Storey and Easingwood, 1998). This allows constructive ideas to improve not only the service, but also the processes of developing and delivering them (Takeuchi and Nonaka, 1986). Cross-fertilization of ideas among diverse functions is especially at the outset of the development process where the opportunity for innovation is the greatest (Goffin, 1988; Hull, 2003). Cross-functional communication also builds commitment for the project and reduces the amount of risk and uncertainty surrounding it (Lievens, de Ruyter and Lemmick, 1999).

If the firm's strategy is based on exploiting tacit knowledge, the impact of organic practices on performance is presumed to be relatively greater. The services offered are relatively more interpersonal, idiosyncratic, and are amenable to augmentation during delivery. Downstream functions such as operations staff and customer service need to be involved early in the development process for the effective implementation and delivery of new services. Team based practices are more necessary to the extent the service product entails human factors and opportunities to spontaneously react to emergent situations transcending the capabilities of programmed actions. Also cross-functional teamwork is needed when dealing with subtle and imprecise information. For example, Hansen, Mors and Lovas (2005) found that established interrelationships are needed for sharing knowledge during service development and that this increased in importance when tacit knowledge was high. Following this line of reasoning one may speculate that the benefit of an OTS is relatively greater for service firms employing a personalization strategy.

Hypothesis 1: The effect of OTS on performance is greater to the extent the firm's strategy is based on personalization.

### **In-process design controls**

Many studies have documented the importance of the quality of development process for new service success (e.g. de Brentani, 1991; Cooper et al. 1994). Further studies demonstrate the benefits from the deployment of formal development processes in achieving the required quality of execution (e.g. Johne and Storey, 1998, Montoya-Weiss and Calantone, 1994). Structured in-process design controls (IDC) is needed for service development team members as much of their work falls outside of the rules and hierarchy of their home departments. IDC involves not only a formal, systematic development process but also the use of structured tools for assessing markets, identifying customer needs, translating requirements into service specifications using methods such as QFD and reviewing service designs (Griffin, 1992). Service blueprinting has been suggested as an important element of a structured NSD process (Bitner, Ostrom and Morgan, 2008). A further aspect of a total quality approach to NSD practices is to continuously review what the firm is doing and benchmarking this against



leading practice, processes can be improved. In addition formal processes help organizations remember and reuse knowledge rather than reinvent unnecessarily (e.g. Meyers and Wilemon, 1989; Marsh and Stock, 2003).

New services based on tacit knowledge require relatively more up-front planning and involvement to counter the problems of reliability and control. Paradoxically, the more uncertainty associated with the new service under development, the more a disciplined, but flexible process is needed to help reduce risk. NSD processes need to be dynamic and flexible because rigid rules and procedures can stifle creativity (Olson, Walker and Ruekert, 1995; Cooper, 2008). Conversely, as explicit knowledge is easier to plan and program into computer-based systems (Salmi et al., 2007), formal processes may add relatively less value during development. Therefore, higher levels of IDC are hypothesized as relatively more important for new services based on a personalization strategy than a codification strategy.

Hypothesis 2: The effect of IDC on innovation performance is greater to the extent the firm's strategy is based on personalization.

### **Computer information technology**

Computer information technology (CIT) has been found to directly affect both the speed of the NSD process and the general effectiveness of the firm's innovation activities (Froehle et al. (2000). CIT plays an important role as an enabler of intra- and inter-team communications, e.g., email, electronic bulletin boards, project management software, management information systems, EDI, etc. Cross-functional team members are able to share product data, access remote expert systems, and exploit depositories of best known methods (Wijnhoven, 1999). Moreover, CIT enables NSD plans to be dynamic and continually updated throughout the development process (Sethi, Smith, and Park, 2001). The effective recording, storing and reviewing of information generated during development has been shown to have a positive relationship with further new product successes (Lynn, Skov and Abel, 1999; Ramesh and Tiwana 1999). In addition, service developers are able to be more analytical in their decision making by using computer-based simulations, e.g., econometric modeling, discounted cash flow analyses, etc. (Edvardsson and Olsson, 1996). CIT is also embedded in the delivery of new service offerings either the form of hardware e.g., ATMs, or software, e.g., risk analyses for life insurance.

However some research provides contradictory evidence as to the impact of CIT on product development success (Song et al., 2007). One reason may be that the utility of CIT is at least partially contingent upon the type of knowledge being shared. Explicit knowledge is easier to exchange via CIT than tacit knowledge. Product designers have been found to value CIT as a communication tool as it provides unambiguous information (Antioco et al., 2008). Therefore if new services are based on explicit knowledge and are programmable, CIT is hypothesized as likely to offer performance benefits. However, if knowledge is tacit, CIT may be inadequate for exchanging information and the impact on performance more limited.

Hypothesis 3: The effect of CIT on innovation performance improvement is greater to the extent the firm's strategy is based on codification.

## **RESEARCH METHOD**

### **Sample**

Large companies were targeted because growth in size increases bureaucratic structuring and other barriers to innovation. The largest service companies in terms of employment were identified from Crain's New York Directory of the top 100 firms. Smaller service businesses ranking in the top 25<sup>th</sup> percentile of their category were also selected to capture the diversity of enterprises within the region. Phone calls were made to identify the most appropriate respondents as not all firms had a dedicated NSD department. Respondents included not only people with specific responsibility for service or business development, but also TQM (Total Quality Management), BPR (Business Process Reengineering), or Productivity Improvement.

Respondents from 70 businesses completed questionnaires, a response rate of 31 percent. The largest industry category was financial services. Most major categories in the service sector were represented except advertising. With this exception, survey respondents appear to be reasonably representative of large service companies in the New York area. The enterprises were almost entirely businesses within large corporations. Eleven of the twelve largest corporations in New York were represented. Only four companies employed less than 500 people.

### **Measures**

A service sector questionnaire of service development was adapted from measures used in earlier goods studies (Hull, Collins and Liker, 1996; Liker, Collins and Hull, 1999) and incorporates measures used in the NSD literature (Froehle et al. 2000). The final measures were drawn from the services literature and suggestion from eight leading service companies participating in a New York based NSD user group that included American Express, Bank of New York, Bankers Trust, Chase, Chubb Insurance, Citibank, Morgan-Stanley, and Merrill-Lynch. They helped recast measures in to better accommodate the diversity of services under study. They also added new measures focusing on the organization of the service function and service delivery. The bulk of the questions asked the respondent to rate the extent of deployment of practices dealing with organization, processes, and computer tools during the past five years as shown in the Appendix of Measures. Ratings of the extent of deployment of practices were rated by respondents on four point scales ranging from "Not at all" to "A great deal."

### *Dependent Variables*

Service innovation performance is measured on a set of 11 items similar to performance measures in previous research (e.g. Johne and Storey, 1998; Storey and Kelly, 2001; Menor and Roth, 2007). All items were significantly inter-correlated and are scaled in a single index of overall innovation performance ( $\alpha = .94$ ). The performance items were also sub-divided into 2 sub-scales: service development performance (6 items,  $\alpha = .87$ ) and service delivery performance (5 items,  $\alpha = .86$ ). Although the principal focus of the research design was on service development, for many types of services its delivery processes are tantamount to the service itself. Therefore delivery process is also analyzed as a performance outcome.

### *NSD System*

A total of 22 items formed constructs representing the three elements of the NSD system:

- *Organic Team Structure (OTS)*. Organic organization design was measured by a set of 7 diverse practices including project-based management, cross-functional teaming, physical collocation, and group rewards ( $\alpha = .93$ ). These questions were unified by the

theme of horizontal integration of input by cross-functional team members in development projects.

- *In-process Design Controls (IDC)*. Nine items measured IDC ( $\alpha = .87$ ). Five of these items dealt specifically with service development and four with general process improvement. The IDC items are unified by the theme of discipline that is dynamic. For example, some questions dealt with the structuring of activities such as setting standards while other focused on dynamic improvements.
- *Computer Information Technology (CIT)*. Nine items are summed to measure CIT ( $\alpha = .83$ ). All questions dealt with tools supporting information management in general and project management in particular, as well as electronic exchanges along the value chain. Seven of the items dealt with the internal deployment of computer information tools. Two items dealt with electronic linkages with external customers and partners.

### *Knowledge Strategies*

Tacit knowledge is difficult to measure objectively because of its myriad manifestations although it is somewhat more easily done for explicit knowledge. One solution is to examine the elements of the service offering that provide competitive advantages. Based on the service literature (Lovelock and Wirtz, 2007; Storey and Easingwood, 1998; Roth and Menor, 2003) and advice from service companies a set of 11 items were identified that provide value to the respondents' services. Factor analysis of the items resulted in two groupings that correspond with the distinction between codification vs. personalization strategies. Two items which loaded on neither factor were deleted. These items were two sector specific and failed to measure generic values of service offerings. The dimension representing evidence of a codification strategy included five items: professional knowledge, knowledge bases/research, software, hardware and communications ( $\alpha = .79$ ). The dimension connoting aspects of a personalization strategy included four items: personal service, convenience, service guarantees, and transactional interaction ( $\alpha = .67$ ) Therefore, we operationalise service firm's knowledge strategies by the extent to which their offerings provide value to customers based on the exploitation of either tacit or explicit knowledge.

### *Other measures*

Companies vary in the extent to which they attempt to offer new and differentiated services. It has been shown that the strategic intent has an influence on both the approaches firms take in developing new products and services and the success of those approaches (Avlonitis, Papastahopoulou and Gounaris, 2001; Hull, 2004). Therefore our analysis controls for the degree of novelty intended by the firm. This means that the results of analysis are due to the impact of operational practices on performance net of strategic intent to innovate.

In addition data was collected on the firm's organization of NSD and linkages with customers. These measures are used to validate the dichotomy between a personalization and codification strategy.

### **Correlations and Validation**

Means and correlations for the constructs are shown in Table 1. Each of the three elements of the NSD system has a significant correlation with all three innovation performance measures. Each of the elements of the system is also significantly correlated with one another. The

correlation between OTS and IDC is very strong. Enterprises pursuing a strategy of novelty perform better than others.

[Insert Table 1 here]

The only significant correlation of an explicit knowledge strategy with elements of the NSD system is with CIT. The only significant correlation of tacit knowledge strategy is with OTS. This contrast is consistent with the congruence anticipated by contingency theory between strategy and structure.

To further profile characteristics of the two knowledge-based strategy dimensions, differences in their association with other measures in the dataset were examined. The contrasting patterns supported by statistically significant differences are summarized in Table 2.

[Insert Table 2 here]

Firms competing via personalization are more likely to decentralize NSD to strategic business units that are presumably close to the customer. By contrast, those competing on explicit knowledge are more likely to centralize NSD at corporate headquarters. They are less likely to have a functional unit responsible for NSD perhaps because their offering is closely intertwined with computer-based operations.

The two types vary in customer linkage. Firms competing on the basis of tacit knowledge are more likely to have customer service employees communicating with customers directly, either face-to-face or by telephone. Employees in firms deploying a codification strategy are more likely to reach customers via electronic networks and to use electronic means to support the delivery of the service.

Deploying a personalization strategy requires diverse specialists to handle varied value creation opportunities with a heterogeneous customer base. Firms competing on the basis of tacit knowledge involved nine different functions in improving service delivery. By contrast, those competing on the basis of explicit knowledge engaged only two functions, IT system support and marketing.

Developing services based on tacit knowledge is entails idiosyncratic transactions requiring customer contact not only before sale, but also after the initial transactions. Firms employing a personalization strategy were far more likely to simultaneously involve both upstream and downstream functions at the concept stage of NSD, e.g., Marketing, Process development, Finance, and Customer service. They were also more likely to have diverse functions engaged post-sale, e.g., Marketing, Process development, Systems support/IT, Administration, Logistics, and Customer service to exploit opportunities of augmenting the service offering. By contrast, businesses competing on explicit knowledge had low levels of cross-functional engagement through the entire development and delivery cycle.

These differences add validity to our approach as they are consistent with the notion of how each strategy drives the service offering. The contrasts in the locus of decision-making and the type of cross-functional involvement are also consistent with our hypothesized relationships between strategy employed and the NSD system.

## **RESULTS**

### **The NSD System and Innovation Performance**

### *Main Effects*

Multiple regression analysis is used to test the effects of the NSD system on innovation performance. Results are shown in Table 3 for the overall performance index and its two components, service development and service delivery. The main effect for OTS is just short of statistical significance while IDC and CIT have modestly significant main effects. For development performance, OTS and CIT have significant main effects whilst IDC is just shy of significance. None of the three elements has significant main effects with service delivery. The only significant main effect is a modest one for tacit knowledge with service delivery performance. The additive model explains slightly less than forty per cent of the adjusted variance in overall performance (Model 1), a little over forty per cent for development performance (Model 4), and a little less than a quarter for delivery performance (Model 7).

[Insert Table 3 here]

### *Interaction Effects*

The hypotheses specify that the impact of the individual elements of NSD system on innovation performance is contingent upon their fit with the knowledge strategy deployed. To achieve this, a series of moderated regression analyses were undertaken with interaction terms between the two knowledge strategy dimensions and the model components. The results conform to expectations:

Hypothesis 1: A tacit knowledge strategy interacts with OTS in affecting performance in moderated regression analysis in all three instances: overall (Model 2), development performance (Model 5), and service delivery performance (Model 8). These results provide consistent support for Hypothesis 1.

Hypothesis 2: A tacit knowledge strategy interacts with IDC in affecting overall performance (Model 3) and development performance (Model 6). These results provide support for Hypothesis 2 except for service delivery.

Hypothesis 3: An explicit knowledge strategy interacts only with service delivery performance (Model 9). This result provides only limited support for Hypothesis 3.

Overall the results for the two dimensions support the notion the impact of the composite model is contingent on the strategy the service firm is employing. The greatest contrast is between the use of OTS for a personalization strategy versus the use of CIT for service delivery for a codification strategy. The interaction effect of a personalization strategy and OTS appears particularly robust as it applies to all measures of performance.

### **Knowledge Strategy Types**

A typology of knowledge types is used to further explore how managers design NSD systems to optimize performance. The two knowledge strategies are modestly correlated (.27) and are therefore not entirely mutually exclusive. Firms were categorized by splitting the measures of knowledge strategy as close to the median as possible. This produced four analytical knowledge strategy types which were named: *knowledgeless* - for those low in both kinds of knowledge (27%); *tacit-intensive* - high tacit, low explicit (17%); *explicit-intensive* - low tacit, high explicit (20%), and *combination* - high in both (36%). These analytical combinations

provide us with a four-cell classification scheme which may be used for profiling the design of NSD systems in each category.

[Insert Figure 2. here]

Figure 2 shows how four knowledge niches compare in terms of the three elements of the composite model and overall performance. In the *knowledgeless* group on the left of Figure 2, the level of activity of the elements that make up the NSD system - organization, process, and tools/technologies are also the lowest of any. Not surprisingly, service enterprises competing in this niche have the lowest level of performance. By contrast, those *combination* firms have the highest deployment of the three building blocks, although only marginally so for OTS and CIT. Interestingly, it is their process capability (IDC) that most differentiates them from competitors in other groups.

In between these extremes, two types contrast starkly. For firms in the *tacit-intensive* group the deployment of OTS is quite high. However, their use of process and technology are low. The *explicit-intensive* type deploys high levels of CIT, but is below average for OTS. The performance for both these groups is average, perhaps because they have only one string to their bow, so to speak.

To further understand the implications of knowledge strategy type on the NSD system we tested interaction effects of each strategy type (dummy variable) with the three elements of the system. For brevity we do not report details of the results but we summarize the two main findings. *First*, for service businesses in the two groups competing on high-levels of tacit knowledge, the combination and tacit-intensive groups, formal processes (IDC) synergistically complement the use of cross-functional teams (OTS). *Second*, service businesses lacking in tacit knowledge, the knowledgeless and explicit-intensive groups, have either no interaction effects or negative interaction effects with the three elements of the contingency model of NSD design with a single exception. The knowledgeless type has a positive interaction with the duo of OTS and IDC, which suggest a path of hope for its innovation strategy.

## **THEORETICAL IMPLICATIONS**

This research has attempts to further our understanding of service innovation by investigating how firms' strategic choices influence the effectiveness of a NSD system. It was postulated that two strategies – one based on explicit knowledge vs. one based on tacit knowledge - would moderate the impact of three basic elements of a composite model of service innovation. The results demonstrated contingent implications for the innovation literature and the services management literature.

For firms emphasizing a personalization strategy, where services involve intangible factors and human interactions there is an increased need for organic practices (OTS) such as cross-functional teaming for innovation success. The interaction demonstrated in the analysis is consistent with the hypothesis that a personalization strategy creates customer value that is relatively more social, interpersonal, and idiosyncratic. In such circumstances organic practices are more necessary as there needs to be the capacity for spontaneously reacting to emergent situations which transcend programmed actions. In addition the knowledge to be exchanged during development is tacit, more uncertain, requiring personal interaction supported by cross-functional co-located teams (Song et al., 2007)

Firms enacting a personalization strategy need to take a disciplined approach. Under such a strategy service development projects are likely to be very fuzzy in nature with high levels of uncertainty. IDC helps cross-functional teams focus more purposively and methodically by formalizing the recording of information and signposting the owners of tacit knowledge. Thus IDC aids innovation performance by encouraging the degree of learning from past projects. However, there is still a danger of over controlling as each project is likely to be very different and the process will need to be adapted from project to project.

In contrast if the basis for competition is codification, and the innovations efforts are geared towards service delivery, extra investment is needed in tools and technology (CIT). Many processes for delivering service based on explicit knowledge are increasingly automated and therefore need sophisticated management information systems and project management systems to integrate development with operations. Firms competing on explicit knowledge may also lack the necessary firm wide integration to develop and share tacit knowledge and are less likely to reap the benefits of using cross-functional teams (Hansen, Mors and Lovas, 2005) which is consistent with the negative interactions summarized for the two groups lacking in tacit knowledge.

This research offers strong support for a contingency approach to managing NSD. This is a contribution because little research in service innovation has investigated contingency effects on NSD practices. A contingency approach may help resolve some of the contradictory research in service innovation. For example findings show a relatively low importance of a systematic and formalized NSD process whereas conventional prescription is that it is most critical to development success (Menor and Roth, 2008). This is consistent with our findings showing contrasting results depending on knowledge strategy.

The further exploration of strategic types makes an important contribution to our understanding as to the complementary nature of development factors. The interaction effects within each strategic type show that formal processes (IDC) synergistically complement the use of cross-functional teams (OTS) for service businesses competing on personalization. This reflects the need for flexibility in the rules of the development process (e.g. Edvardsson, Haglund and Mattsson, 1995; Moorman and Miner, 1998; Hull, 2004). Together OTS and IDC create a dynamic NSD system that can be considered ambidextrous in nature - being able to allow creativity but within disciplined bounds and, unlike rigid procedures, may serve as a linking pin between personal knowledge on the one hand with codified knowledge on the other. The importance of blending teams and processes has also been found in studies of goods industries (Hull, Collins and Liker, 1996; Liker, Collins and Hull, 1999).

The negative interactions between the use of CIT and the other two elements of the NSD system for firms who are lacking in tacit knowledge are harder to explain. In theory, firms can employ CIT to aid NSD by automating communication and development processes. However, often firms do not invest enough in training people to make effective use of such tools. Automation often fails if human capital is insufficient to first create and standardize appropriate processes for computer automation. Or they use CIT to replace other rich forms of communication and project teams lose the benefit that personal interaction brings (Song et al., 2007). However further research is needed to confirm or deny these explanations.

A further contribution this research makes to the literature is as an exploratory study into the generic strategies service firms adopt. This research has identified four strategic groups of service firms and it has been shown that each group requires a subtly different approach to NSD. This exploratory typology is constructed that appears to be a fruitful way of classifying

services. To date there is limited empirical support for existing taxonomies of service firms (e.g. Boyt and Harvey, 1997; Clemes, Mollenkopf and Burn, 2000) and whilst there are significant differences in the problems faced by different types of service firms there is a paucity of empirical research into the implications for effective service management. Analysis of the data using standard classification codes or nominal business categories such as banking, insurance, healthcare, did not produce significant results. The approach to classifying services we utilized has merit as it is based on service firm's behaviour rather than sector characteristics or nominal categories (Jambulingam, Kathuria and Doucette, 2005). This is akin to the demographic versus behavioural approach to segmentation. This is the first time such a typology has been used and future research on typologies of service should consider building on the underlying dimensions of knowledge strategy. In particular, it would be interesting to find out how the mix of tacit and explicit knowledge affects optimal deployment strategies in other business practices.

## MANAGERIAL IMPLICATIONS

Contingency theory has implications for designing NSD systems. Because the impact of the three elements of NSD practices on performance varies somewhat depending on the firm's knowledge strategy, innovation managers should right-size their use of these practices. If the firm's strategy is based on tacit knowledge, OTS may need "over-deployment" relative to the norm (Woodward, 1965). By contrast, under a codification strategy, OTS may need "under-deployment relative to the norm. This is important as people intensive processes are expensive. The complementary argument should also be considered. If the firm competes on personalization, the deployment of CIT to automate services may fail to appeal to customers and as a result be prohibitively expensive to the firm. However, failing to automate what can be done without alienating customers incurs opportunity costs.

In general, the more knowledge firms have for offering different kinds of value to customers, the better their performance. But how can managers improve the design of their NSD systems within the context of their knowledge capabilities? If you are a manager of a typical firm in the *knowledgeless* category, do you choose a personalization or a codification strategy? The best tactic seems to be to be targeting the development of innovative new services by employing OTS to stimulate creativity. However, this is easier said than done. As knowledge resources are scarce, innovation must be achieved cost effectively. If the NSD system is designed using OTS to bring people together *and* IDC to discipline costs, innovation performance is likely to be relatively higher. By contrast, an alternative tactic of automating with CIT is worse than a non-starter. These firms do not have enough knowledge to create effective standardized processes

Tactics for improvement for the *tacit-intensive* group seem fairly straightforward. First, target innovation and further exploit core competencies in tacit knowledge via the use of OTS. Second, optimize OTS by simultaneously deploying IDC to provide synergistic discipline. Remain a skeptic about the benefits of CIT, at least until the business has further matured.

Improving the performance of businesses in the *explicit-intensive* niche is more problematic. All interaction effects were negative, especially for service development performance. For these firms increasing the use of processes and teams negatively affects the innovation performance, and the use of CIT compounds this problem. One reason may be that firms competing on explicit knowledge are centralized in their NSD decision-making and have low levels of cross-functional engagement during development. If this is the case, resources spent on OTS to bring diverse people together are unnecessary when service delivery decisions



have already been programmed. It may be the case that such firms need to be willing to take a hit in terms of their innovation performance while they learn how to work together organically.

Competing on both tacit and explicit knowledge offers customers a winning combination. This may be illustrated by how some consultancy firms compete by repackaging codified knowledge from one client to sell to the next after collecting tacit knowledge about the unique characteristics of the client firm. The tactics recommended for firms in the *combination* group are to use more OTS, especially in combination with IDC. However there is still a danger of over controlling as each project is likely to be very different and the process will need to be adapted from project to project.

## CONCLUSIONS

This paper has recast a system of product development in terms of services and extended this to include contingent factors. A model of three elements was found to predict significant levels of variation in innovation performance for firms in a sample of 70 large service enterprises. The results have important implications for the service development literature and the more general service management literature. It has been shown that firms taking a personalization approach to competing in the marketplace contrast starkly with firms taking a codification approach. This contrast reflects the organic vs. mechanistic distinction of Burns and Stalker (1961) in that one is more reliant upon human capital, the other on mechanistic processes and automation.

It is clear that a one size fits all approach to NSD is no longer appropriate. The impact of each of the sets of practice in the system was found to be contingent upon the knowledge strategy. If the firm's strategy is based on tacit knowledge, organic practices have more positive effects on performance than for services based on a codification strategy. For those services based on explicit knowledge, information technology is relatively more beneficial for performance if trying to achieve innovation in the delivery aspects of the service offering.

Like most research in the innovation arena the data relies on a self-reported survey which has its limitations. Whilst objective measures are desirable none were systematically and readily available at the level of analysis. Future research could attempt to link this research to organizational performance. In addition the data captures a snapshot in time. However the way firms compete is dynamic in nature. Longitudinal analysis could look at how firms adapt their knowledge strategies over time and how this affects the ability of service firms to innovate.

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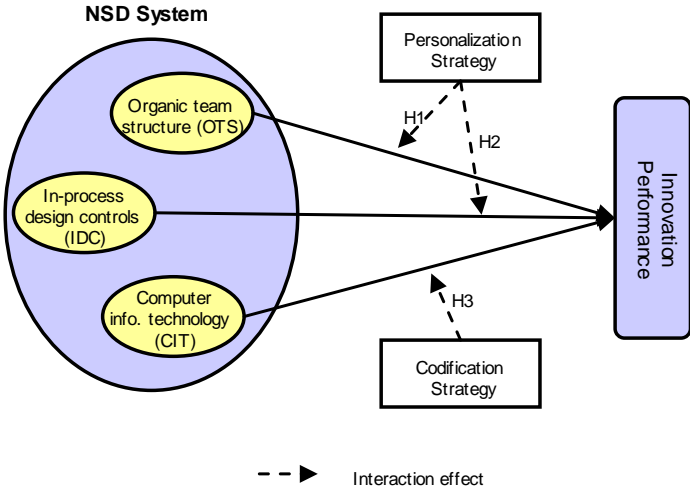
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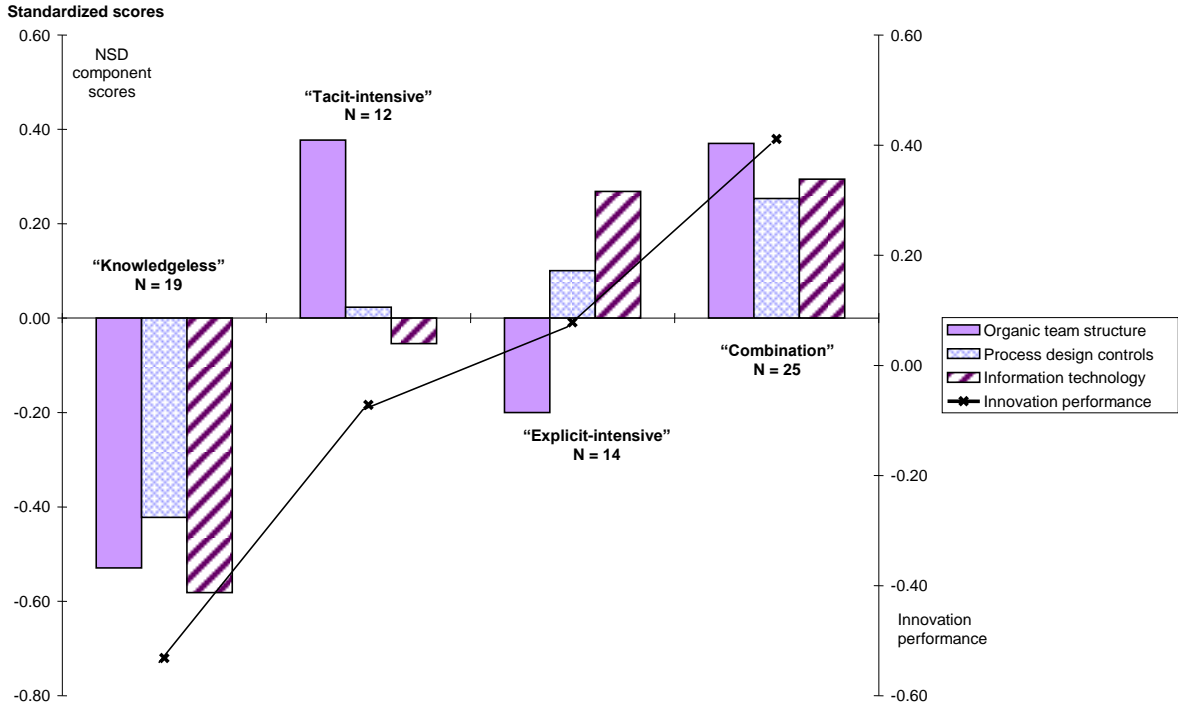
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**Figure 1. New Service Development System with Strategy Contingencies**



**Figure 2. Knowledge Strategy Types and NSD Practices**





**Table 1. Correlations and Descriptive Statistics**

	<b>Performance</b>	<b>Development</b>	<b>Delivery</b>	<b>OTS</b>	<b>IDC</b>	<b>CIT</b>	<b>Personalization</b>	<b>Codification</b>	<b>Innovative Policy</b>
<b>Overall Innovation Performance</b>	1.00								
<b>Development Performance</b>	.87**	1.00							
<b>Delivery Performance</b>	.91**	.60**	1.00						
<b>OTS—Organic Team Structure</b>	.57 **	.65**	.55**	1.00					
<b>IDC—In-process Design Cont.</b>	.56**	.59**	.45**	.78**	1.00				
<b>CIT—Computer Info. Tech.</b>	.37 **	.45**	.26*	.37 **	.38**	1.00			
<b>Personalization Strategy</b>	.30 **	.18	.31**	.33 **	.19	.13	1.00		
<b>Codification Strategy</b>	.22	.20	.11	.07	.20	.30*	.27 *	1.00	
<b>Innovative Policy</b>	.46 **	.49**	.36**	.52 **	.56 **	.31*	.15	.16	1.00
<i>Mean (scale 0-4)</i>	2.30	2.70	2.73	2.22	2.14	2.17	1.93	2.00	2.14
<i>S.D.</i>	.73	.77	.86	.83	.74	.69	.71	.73	1.13

\*p=.05 \*\*=p=.01

**Table 2. Profile of the Knowledge Strategy Dimensions**

<b>Practices</b>	<b>Personalization Strategy</b>	<b>Codification Strategy</b>
Locus of NSD decision-making	Decentralized to SBUs	Centralized at HQ; unlikely to have dedicated development department
Type of customer linkage	Face-to-face or phone	Electronic networks utilization
Cross-functionality involvement in improving <i>service delivery</i> : 1. Marketing 2. Product development 3. IT (system support) 4. Process development 5. Finance 6. Administration 7. Logistics 8. Sales 9. Customer service	Yes No Yes Yes Yes Yes Yes Yes Yes	No Yes Yes No No No No No No
Stage of cross-functional involvement in <i>service development</i> : • Early (concept) • Middle (initial sale) • Late (post sale)	High Low Medium	Low Low Low

**Table 3. Regression of Innovation Performance on Predictors**

	Overall Performance			Development Performance			Delivery Performance		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
OTS—Organic Team Structure	.21	-.53t	.23*	.28*	-.23	.30*	.17	-.41	.24
IDC—In-process Design Controls	.22t	.17	-.38	.20	.16	-.43	.17	.13	.17
CIT—Computer Info. Technology	.18t	.23*	.20*	.24*	.27**	.26*	.12	.15	-.69t
Personalization Strategy	.12	-.52t	-.46	-.04	-.52t	-.64t	.18t	-.36	-.18*
Codification Strategy	.05	.08	.07	.06	.08	.08	.01	.02	-.79
Innovative Policy	.17	.19t	-.20t	.16	.17t	-.18t	.17	.18	.15
Personalization x OTS		1.16*			.80t			.90t	
Personalization x IDC			.85t			.89t			
Codification x CIT									1.26*
R <sup>2</sup> Unadj.	.44	.48	.46	.48	.50	.50	.31	.33	.35
R <sup>2</sup> Adj.	.37	.41	.39	.42	.43	.43	.23	.24	.26
F-Ratio	7.0**	6.8**	6.3**	8.1**	7.3**	7.4**	3.9**	3.7**	4.0**
F-Ratio Δ		3.7*	2.0t		1.8t	2.1t		.18t	3.4*
R <sup>2</sup> Δ		.04	.02		.02	.02		.02	.04

\*\* p=.01 \*p=.05 t=.10

## Appendix: Concepts and Items

<b>Overall Innovation Performance (<math>\alpha = .94</math>)</b>
<p><b>Service Development Performance</b></p> <p><i>To what extent have your service products changed during the past 5 years?</i></p> <ul style="list-style-type: none"> <li>• New features</li> <li>• Upgraded features</li> <li>• Higher quality</li> <li>• Reduced cost</li> </ul> <p><i>To what extent have your service development changed during the past 5 years?</i></p> <ul style="list-style-type: none"> <li>• Shorter time from concept to test market of service product</li> <li>• Shorter time from test market to full-scale delivery of the service product</li> <li>• Reduced cost of development</li> </ul>
<p><b>Service Delivery Performance</b></p> <p><i>To what extent has your service delivery changed during the past 5 years?</i></p> <ul style="list-style-type: none"> <li>• Shorter response time to order for existing service products</li> <li>• Shorter time for adjustments to complaints</li> <li>• Better after sales support services</li> <li>• Higher quality of delivery process, e.g., fewer customer complaints</li> <li>• Conformance with service product development process and procedures</li> </ul>
<b>OTS - Organic Team Structure (<math>\alpha = .93</math>)</b>
<p><i>To what extent have you emphasized the following activities in service innovation during the past 5 years?</i></p> <ul style="list-style-type: none"> <li>• Cross-functional teaming</li> <li>• Strengthening the role of project managers</li> <li>• Cross-training specialists</li> <li>• Increasing the influence of downstream functions in upstream decisions</li> <li>• Reorganization of jobs to reduce hand-offs</li> <li>• Collocating complementary functions</li> <li>• Rewarding project teams/groups</li> </ul>
<b>IDC - In-process Design Controls (<math>\alpha = .87</math>)</b>
<p><i>To what extent have you engaged in the following activities in service innovation during the past 5 years?</i></p> <ul style="list-style-type: none"> <li>• Improving documentation of processes</li> <li>• Setting performance criteria for projects</li> <li>• Setting standards for the performance of products</li> <li>• Institutionalizing systematic reviews for development projects</li> <li>• Benchmarking best-in-class companies</li> <li>• Using structured processes for identifying customer needs and translating into requirements (e.g. QFD)</li> <li>• Mapping/blueprinting processes to reduce non-value added activities</li> <li>• Measuring conformance with processes</li> <li>• Institutionalizing continuous improvement processes</li> </ul>

**CIT - Computer Information Technology ( $\alpha = .83$ )**

*To what extent have you emphasized the following activities in service innovation during the past 5 years?*

- Linking electronically (EDI) with externals, e.g., suppliers, partners, etc.
- Linking electronically with customers, e.g., EDI, computer networks, etc.
- Management Information Systems/Expert Systems
- Distributed databases on-line to multiple functions
- Company internal communications via e-mail or other computer networks
- Updating existing IT systems
- Common software for project management
- Common software for process mapping
- Building on-line databases with lessons learned and best practice templates

**Codification Strategy ( $\alpha = .79$ )**

To what extent do the following help create value to your service products?

- Knowledge databases
- Professional knowledge
- Software
- Communications
- Hardware

**Personalization Strategy ( $\alpha = .67$ )**

To what extent do the following help create value to your service products?

- Personalized service
- Transformational interaction
- Convenience
- Service guarantees

**Innovative Policy: Control Variable**

To what extent did your strategy for the past 5 years focus on:

- Developing novel service products