Technology as a driver for changing customer-provider interfaces

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Technology as a driver for changing customer-provider interfaces

Evidence from industrial service production

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Abstract

Purpose – This paper explores how information and communication technology (ICT) is affecting and driving changes in the service processes and customer interfaces of capital goods manufacturers.

Methodology/approach – The research is focused on intra- and inter-organizational relationships, i.e. between front office and back office and between provider and customer. Two market-leading, international manufacturing firms were selected for in-depth case studies.

Findings – By means of ICT systems and applications, it is becoming increasingly possible to replace tasks through an integration of processes between organizational units, either between front office and back office or between front office and customer. Closer technical integration between provider and customer can be a basis for more advanced and extensive offerings. In bundled offerings, not only one but a number of service production process interfaces become important.

Research limitations/implications – As the local service organizations in three Western European countries have been studied, the general applicability of the findings may be limited.

Practical implications – The results of this study stress the importance of developing capabilities to manage several process interfaces simultaneously. Furthermore, an important message is that firms must balance the interplay between process automation and personal interactions when delivering industrial services.

Originality/value – ICT systems are becoming more critical for the provision of industrial services. This paper provides an insight into how technology enables new service processes.

Keywords Service processes, Industrial services, Provider-customer relationships, Front office, Back office, Information technologies

Paper type Research paper

Introduction

The trend in manufacturing firms towards the provision of services related to the goods produced has been highlighted by several authors (e.g. Henkel et al., 2004; Howells, 2004; Penttinen and Palmer, 2007; Wise and Baumgartner, 1999). Services can be critical for nurturing customer relationships and for enabling more sophisticated, process-orientated offerings with higher margins than product sales (Mathieu, 2001; Oliva and Kallenberg, 2003). Besides, new industrial services represent a key source of growth for many firms (de Brentani, 1995). However, when analyzing the service content and the service operations of manufacturers, it is not enough to focus on the internal service organization (e.g. front and back office) as the customer is also a source of products (Hill, 1977), and a participant in the service production process (Grönroos and Ojasalo, 2004).

New technology is an important driver for new offerings and the application of Information and Communication Technology (ICT) can be used to improve the existing service processes of manufacturing firms and to drive new, more advanced services and solutions. ICT may initiate a radical transformation of traditional customer-provider interfaces (Nambisan, 2002) and the firm's internal service processes through standardization (Sundbo, 1994). Nevertheless, the impact of ICT on industrial service processes has been insufficiently examined as most studies do not focus on business-to-business relationships (cf. Ritter and Walter, 2006) and those that do, tend to focus on product sales, not on services (e.g. Hunter and Perreault, 2007; Lapierre and Medeiros, 2006; Ledingham et al., 2006; Tanner and Shipp, 2005).

This paper fills the gap by exploring how ICT is affecting and driving changing service processes and customer interfaces among capital goods manufacturers. A framework for analyzing service organizations developed by Larsson and Bowen (1989) serves as the theoretical basis of this study and two in-depth case studies illustrate the phenomenon.

Theoretical background

Different services require different service processes and thus, the intra-firm and inter-firm interdependence patterns between organizational entities differ (Larsson and Bowen, 1989). Because value is co-created, customers themselves participate in

the service production process to various degrees thereby influencing their own satisfaction and perceived quality (Normann and Ramírez, 1993) and therefore the interactions between provider and customer can be an important source for service development and innovation (Gallouj and Weinstein, 1997). Depending on the level of customer participation, the service system can differ greatly (Bitner et al., 1997; Grönroos and Ojasalo, 2004).

In Larsson and Bowen's (1989) view, the willingness of a customer to participate is defined by the extent to which the customer plays an active role in supplying e.g. personnel or information to the service production process. The provider can adapt to the customer's characteristics both proactively, through new service designs, and reactively. Over the last decade, many industrial enterprises have outsourced services previously produced in-house (OECD, 2005) and in such cases, the disposition to participate in service production has been reduced in these firms and the provider has taken on a more extensive role.

Another important issue is the internal division between front office and back office, with their various degrees of coupling. In order to better understand the different service production modes and internal coordination aspects, we use a contingency framework to study the service production system and to study the implications of process interfaces between service organizations and customers, proposed by Larsson and Bowen (1989).

In this framework, concern is taken not only to the degree of customer participation but also to the uniqueness of customers' demands. This includes both the uniqueness of the products/processes to be serviced for the customer and the uniqueness of the desired outcome. High diversity of demand refers to qualitative differences in demand whereas demand for the same service in different quantities is considered as low diversity of demand (Larsson and Bowen, 1989). Therefore, this dimension is related to the customization-standardization discussion (e.g. Anderson et al., 1997), however one crucial difference between diversity of demand and degree of customization is that customer demand represents external market conditions facing the firm. Subsequently, the firm can respond to these conditions with more or less customized service design.

Together, the two contingencies – diversity of demand and customer disposition to participate – compose a typology with four different service interdependence patterns and the level of input uncertainty constitutes the diagonal (see Figure 1). The main

locus of interdependencies in each quadrant is the most complex area of coordination in the respective service production process. Building on Thompson's (1967) work, Larsson and Bowen (1989) align the interdependencies in order of complexity: pooled, sequential, and reciprocal. For sequential standardized services like car rentals, most of the workload is placed on the customer and the provider's role is to facilitate these standardized service designs. On the other hand, dialogue between customer and front office is required if the service is complex and unique (i.e. a reciprocal service), such as corporate legal advice. For repair services and other sequential customized services, the customer's unique requirements precede the actual service production, which is mainly an internal matter between front and back office. Finally, a pooled service design allows for allocating a majority of the work to back-office operations decoupled from front-office influence and independent of the customers. Remote monitoring of wastewater and sewage plants is one example of this type of service.

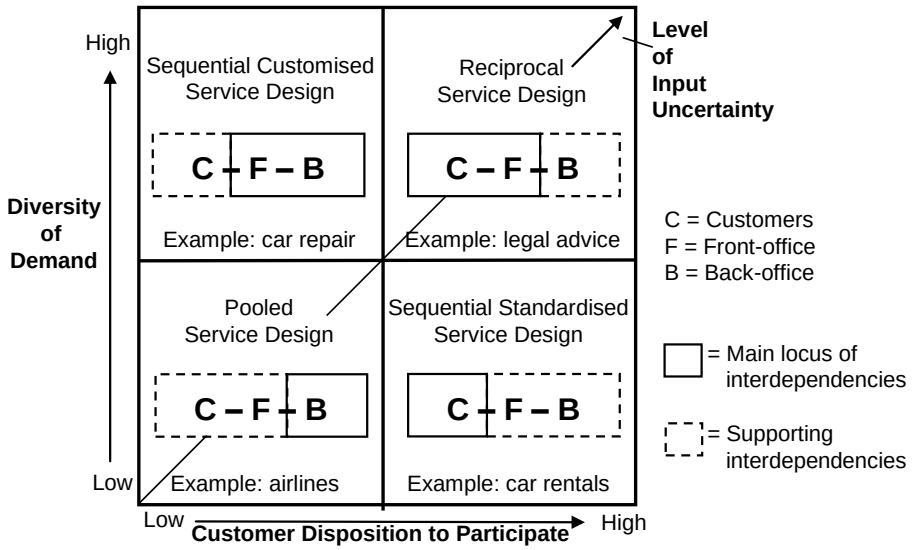

Figure 1. Service production process interfaces (Larsson and Bowen 1989, p. 221)

In the original framework the customer is described as one single entity only. In an industrial context, as is the focus in this paper, the complexity is often higher since not only the provider but also the customer firm can be described by front-office and back-office entities. Nevertheless, for exploring the service production process from the provider's point of view, it is not regarded as necessary to make such a division. Thus, the original framework with one customer entity is used.

It is of interest to discuss the consequences and implications of new ICT on the service production processes through this framework as it may affect the provider-customer interfaces and thereby have repercussions on the premises behind the service offering. Attention should not be limited to ICT that influence existing service processes but instead the provider should also consider using technology that enables him to provide value in new ways (cf. Hunter and Perreault, 2007). Many resources and activities can be dematerialized and unbundled in terms of place (where they take place), time (when they take place), actor (who performs them), and actor constellation (with whom they are performed) and then be re-bundled into new offerings with a denser level of resource integration (Normann, 2001). It is therefore of interest to also discuss the effects of ICT on the headquarters-subsidiary relationships, as many capital goods manufacturers operate on several geographical markets. Ghoshal and Nohria (1989) recognize centralization and formalization as primary attributes of headquarters-subsidiary relationships and these two aspects thus deserve attention.

Methodology

The research process was an iterative process matching theory and reality, where advantage was taken of the systematic combining of both the empirical world and the theoretical models (Dubois and Gadde, 2002). The process is grounded in 'abductive' logic and can be characterized as going back and forth between the data and the theory, creating fruitful cross-fertilization. Siggelkow (2007) believes that research involving case data overcomes several shortcomings of purely conceptual arguments and moreover, using case data in the research enables the researcher to get closer to the theoretical constructs and provides a more persuasive argument about causal forces than broad empirical research can.

Cases were chosen that met four primary criteria: (1) the firm is an international market leader, (2) the firm has an in-house service organization, (3) ICT is used to change current service processes and create new ones, and (4) it was possible to have access to key informants. Eventually, the two international firms BT Industries and ITT Flygt were selected for in-depth studies and this choice of firms was a deliberate research design parameter to ensure some degree of general applicability (Gummesson, 2000), so that replication logic may be claimed (Yin, 2003). Accordingly, our findings are believed to apply also to other firms in moderately

dynamic industries. The analysis of within-case data was made before cross-case analysis was initiated, which corresponds to Eisenhardt's (1989) and Yin's (2003) idea to first become familiar with each case as a separate entity.

The interviews were loosely structured with the help of an interview guide (i.e. a semi-structured approach). The respondents were presidents, service managers and other local managers at the Swedish, British, and Danish subsidiaries of BT Industries and local managers at the Swedish and British subsidiaries of ITT Flygt, as well as central managers and application specialists within these firms. In addition, seven managers of customers, responsible for either operational or strategic procurement and provider relationships, were interviewed. In total, 34 interviews, lasting between twenty minutes and five hours, took place between 2004 and 2007. Furthermore, internal and external meetings, workshops, intranets, and internal documents were used as sources of information.

The case firms

BT Industries

BT Industries (BTI) is a worldwide supplier of warehouse trucks, counterbalanced trucks, manual trucks, and material-handling services with net sales totaling $1.84bn in 2005. The firm is of Swedish origin and is part of the Toyota Material Handling Group. Of the 8,900 employees, 42% are employed in the service market, whereof a majority works as service technicians. New technology is increasingly being built-in into the trucks and increasingly specific software and ports are being required to serve them. EASY, a mobile business system has been used in Europe since 2002. The service technicians each have a PDA linked to the ERP system where they can receive and report work orders online while working in the field. With regard to service strategies, the main goal is to increase the share of long- and short-term rental fleet trucks. Approximately 40% of all new trucks in Europe are sold through rental plans and the number is steadily increasing. The second aim is to sell more total Service Level Agreements (SLAs) and lastly, they aim to increase the number of preventive maintenance SLAs. In recent years there has been an increase in the number of central agreements which comprise of not only product sales but also services.

ITT Flygt

ITT Flygt (Flygt) is part of the ITT Group and the world-leading supplier of submersible drainage, sewage, and propeller pumps and sewage mixers. At year-end 2006 Flygt had a turnover of $1.14bn. Service operations are performed either by the local service organizations or by authorized and independent service partners. A majority of the SLAs are preventive maintenance contracts but many customers do not have any agreements and many of these customers buy service from competing service firms. Nevertheless, the trend is to emphasize SLA sales and to offer more extensive offerings, such as building and repairing pump stations instead of only repairing the pumps. Extensive service offerings require competences most service partners do not have, which makes it critical for Flygt to have their own service organization. In discussions with customers, it can be problematic to point at the monetary values of the offering as Flygt would then have to know the customer's costs, something the customer himself often does not know. Outsourcing, increased awareness of energy costs, etc. imply an opportunity for Flygt to extend its role both towards customers and towards actors like contractors and consultants. Offering extensive undertakings and knowledge-intensive services however, may cause conflict with other actors in the value network.

Discussion

The development of services with regard to customer involvement and business focus can be discussed in connection to the different interfaces in service production suggested by Larsson and Bowen (1989). In this model, fleet management, customer training, life-cycle cost analysis, and other problem-solving and business-development services are examples of services produced with *reciprocal service design* (see Figure 2). Many new services, such as Flygt's calculations of water hammer effects on the customers' pump systems, are information-based and ICT is a prerequisite for these. For such services, a close interaction and dialogue between the provider and the customer is required, and the co-creation of value plays a central role when the cumulative knowledge and experience of both actors are harnessed to jointly create these services. For the provider, new reciprocal services help to create specialized skills and knowledge that is later codified and formalized so that it can be reused and offered to other customers; BTI's flexibility parameters in rental plans are an example of this.

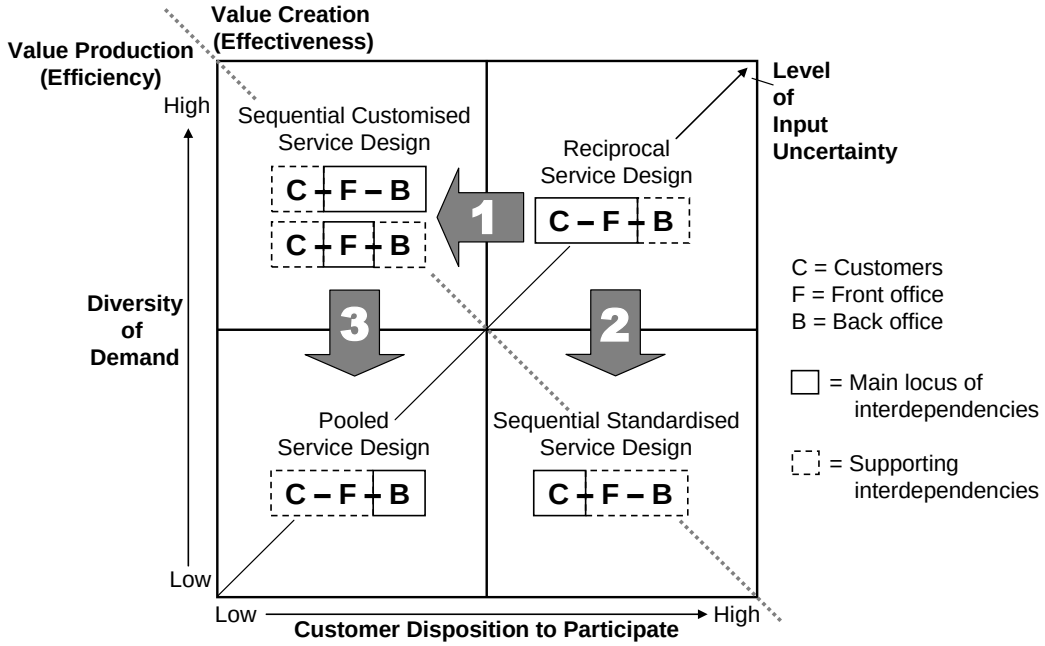

Figure 2. Changing interfaces in service production (the movements supported by ICT and represented by the arrows are further elaborated in Table I)

When formalized, many services no longer require the same reciprocity and dialogue and as routines are established, the services become sequentially customized. As a result, service production is not necessarily co-creation any more but can instead be co-production, i.e. no 'new' value is created (Ballantyne and Varey, 2006); that is to say that existing service production processes are repetitive in nature (making and keeping promises) and thus standardized rather than customized. Thus, a diagonal intersects the level of input uncertainty in Figure 2 and value creation implies a focus on effectiveness and sometimes unknown outcomes, whereas value production implies a focus on efficiency and involves low input (and output) uncertainty. The same goes for services with sequential standardized design and for services with pooled design, interactions are mainly informational and value is produced, not created.

Repair and maintenance are generally associated with *sequential customized service design* where the customer request and specification precedes the service provider's service performance. On the other hand, surveillance, online ordering of spare parts, and relatively trivial repair and maintenance work have *sequential standardized service design*. For these services, the provider offers customers the

technical infrastructure (e.g. a web portal) and other required resources (e.g. technical manuals) for them to serve themselves. The case of customers monitoring the sewage treatment process themselves rather than outsourcing the surveillance to Flygt is an example of this. Finally, services like remote monitoring and software upgrades can be managed mainly through *pooled service design*. Although the pooled service design is the least complex interdependence, the underlying technical infrastructure can be at least as complex as systems supporting more complex interdependencies. Thus, the degree of complexity of the organizational interdependence does not reflect the degree of knowledge and experience required by the provider to design and produce the service.

Changing patterns of process interfaces

The increased standardization and automation of existing service processes means that some services previously produced by interaction between the provider and the customer gradually become produced by one actor only. On a day-to-day basis, the service encounter plays a less significant role than it previously did. ICT can be connected to the customer's systems through the installed base whereas other systems may connect the provider and customer independent of the goods. Thus, back-office employees receive customer information either through the front office or through information systems.

Not only has new technology enabled more activities without direct customer contact, but it has also enabled front-office personnel to be substitutes for some previous back-office activities. Mobile business systems such as BTI's EASY require service technicians to increase their role in administrative activities which have previously been performed by back office. Thus, the main locus of interdependence in e.g. a sequential customized service design may change in some cases to a role where front office may be regarded as the sole locus. This is not necessarily the same as front- and back-office functions being performed by the same employees; the back-office function still exists as a separate organizational entity but *i)* back-office employees play a less significant role in the service production process, *ii)* some processes for the coordination of service support are automated and/or eliminated, and *iii)* a decoupling takes place between front and back office. The customer's supportive participation is still needed in order to initiate the service, and back-office support is still required for the decoupled customized service design but not necessarily more

than in the case of a reciprocal service design. Larsson and Bowen (1989) argue that spatially dispersing activities lead to a risk of reduced service quality due to miscommunication and the partial decoupling which has taken place at BTI due to EASY implies that service technicians very seldom interact with back-office employees. However, even if it has not yet been possible to estimate the long-term effects of EASY, the advantages have clearly outweighed the disadvantages in terms of both service quality and cost efficiency, with annual savings of more than $3mn.

Technological advances affect both the traditionally manufactured goods and the related services. It is becoming increasingly possible to replace both the goods and the tasks of service personnel with automation and dematerialized integration of processes, something which has direct implications on the customer interfaces and thus on the service design. Hence, there is a development from reciprocal to sequential customized service design (where the provider takes the main role) not only because customers are outsourcing service operations (and are therefore less inclined to participate in the service production process), but also because of ICT. Reducing the output uncertainty (i.e. performance risk) and thereby improving the reliability and accuracy of the production is another driving force that is moving the interfaces left and downwards in Figure 2. It is ICT applications and systems that enable new, standardized service processes (not changes in external market conditions facing the providers in terms of decreased demand diversity), that are the explanation for the development from reciprocal to standardized and pooled service design. Thus, this development is taking place not because customers are becoming more homogeneous (instead, there is actually an increasing diversity of demand) but because of technological advances and ICT implementations in the service organizations, which allows the firms to respond to customer demand through more standardized processes. For example, EASY has reduced lead-times dramatically as work assignments are now planned, performed, reported and invoiced in a more formalized, systematic way than previously. Remote monitoring of pump station performance and the reading of truck diagnostics on the PDA are two other examples of elimination of manual work and streamlined service processes. Furthermore, information systems enable BTI and Flygt to provide services by reusing codified knowledge instead of being dependent on individuals and personal interactions (cf. Hansen et al., 1999). Some of the ICT-related changes in service production are presented in Table I.

Table I. ICT-related changes in service production process interfaces

Service process design	**Delivery characteristics**	**Examples**
New reciprocal (people–people design)	High local responsiveness is critical (front office work can be supported by ICT support)	Plant analysis, new pricing models based on product performance, new calculation and systems engineering services based on ICT
Arrow 1: Changing from Reciprocal to more Sequential customized design (people–system design)	A combination of local responsiveness (front office) and standardization and international integration (back	ICT enables standardized report packages, SLAs, automated knowledge management (codified knowledge)
Arrow 2: Changing from Reciprocal to more Sequential standardized design (system–people design)	Consistent local service production regardless of people or subsidiary is reached through international services based on standardized processes	Technological systems enabling subscription to ICT applications and linkages to other processes and products (e.g. surveillance), web interface
Arrow 3: Changing from Sequential customized to a Pooled service design (system–system design)	International integration that is possible to develop into standardized and global integrated services	ICT enables pump monitoring and supervision services, new features available in EASY through software updates

Particularly in the case of BTI but also for Flygt, the market trend is towards more bundled service offerings. In bundled offerings, several patterns of service production process interfaces are important and in a fixed-price SLA or rental plan, all portfolios of interface patterns become to some extent important. Thus, one has to manage several interfaces and understand the dynamics of the service design. Being market leaders, the firms have to manage all interfaces and work simultaneously with both reducing costs and facing the price pressure, and with the new services, proactively and reactively meet customer demand. Most of Flygt's SLAs are site-specific and BTI's rental plans and SLAs are either site-specific or national. However, a major key account customer of BTI recently signed an international service agreement in

connection to its ongoing, international truck agreement with BTI. In international agreements, the interfaces become even more complex as coordination is required between back office and several front-office entities, i.e. one in every country for which the agreement is signed. Due to the outsourcing of industrial services, sequential standardized service design is probably the least common interface for these bundled services. Despite reduced customer disposition to participate in some service processes, personal interactions are critical for long-term relationships (Grönroos and Ojasalo, 2004), and with increasingly advanced and complex offerings, there will also be a continuous need for services where front-office personnel from both sides co-create the value produced.

The headquarters-subsidiary relationships

The local subsidiaries have traditionally had a high degree of independence, which has resulted in local service development and information systems which are not fully or only partially compatible with central and other local systems. Increasingly, therefore, ICT needs to be supported by central management commitment and not be left to individual subsidiaries to develop and implement. The central service organization is better able to allocate time and resources for new projects, particularly large-scale ones. Although input from local management is necessary, central coordination can enable technical standardization and facilitate more cost-efficient solutions, thereby achieving economies of scale. For example, it would not have been possible for the BTI subsidiaries to develop the EASY system and the firm's common European pricing structure would not have been possible without a uniform systems platform. Even if there are many examples of local initiatives for new technical solutions, a majority of Flygt's calculations software and remote monitoring software and circuits are developed centrally before being deployed locally. However, the success is dependent on the local entities' responsiveness to the new services.

The main obstacle to increased centralization has been disagreements and different interfaces between BTI's and Flygt's central service organizations and their subsidiaries. However, local managers believe that increased centralization is positive as long as centrally-developed systems facilitate the service organizations and enable them to allocate resources more efficiently and effectively to their core operations. This presumes that central management takes into account the needs of the operative personnel in order to gain acceptance for the new systems and processes. Both Flygt

and BTI clearly endeavor to gain increased central control and technology is the key that has enabled these centralization strategies. Linked to the formalization of service processes, increased resources centrally allocated to ICT have facilitated a standardization of service processes and compatibility between information systems and between subsidiaries. For BTI, this has enabled the firm to offer standardized report packages for fleet management solutions. This is critical for the increasing number of international key account agreements in which customers want to receive aggregated reports in which costs are specified for all local sites (and even costs per truck). This implies a closer integration between central organizations and subsidiaries as well as between subsidiaries (cf. Ghoshal and Bartlett, 1990). In addition, as more activities are coordinated centrally, displacement takes place because the subsidiaries become a more refined front-office organization, while on a central level there will also be a certain number of front-office activities, particularly with regard to international customers.

Managerial implications

New ICT facilitates the formalization, standardization, and centralization (particularly of back-office activities) of service processes. This goes hand in hand with the formation of a global service infrastructure that can act in response to local, customer-specific needs, and to more extensive service undertakings both in terms of scale (nation-wide SLAs, etc.) and scope (new rental plans, etc.). Cost efficiency requirements are driving BTI and Flygt to implement many of the ICT applications and systems. However, as the firms are market leaders, automation should reduce input uncertainty, internal service-related costs, and relationship costs for the customer as long as the customer does not perceive this as eroding the quality of the service. Thus, finding a balance between automation and interaction and between efficiency and effectiveness is needed in order to produce/create value; i.e. have reciprocal service design when required and have more standardized and decoupled interdependence patterns otherwise. Many existing services require less customer interaction than previously and internally, the role of the local back office is decreasing although local-central integration has increased.

To an increasing extent, several service processes and designs have to be managed simultaneously, implying that new capabilities (that is ‘repeatable patterns of action in the use of assets to create, produce and deliver offerings’ (Ramírez and Wallin, 2000))

may be required. Firstly, as the division between service and product offerings becomes ever more blurred (such as rental plans), front-office personnel must become more proactive and integrate more fully with product sales and vice versa, i.e. the product-service capabilities must be developed. In doing so, the local units must be given the freedom to customize their offerings, although this should be based on the 'bits' of the common solution to limit the extent of costly, local customization.

Secondly, the capability to identify how value can be created through ICT is needed both in the firms providing the services as well as in the customers' organizations. The firms must manage the ICT architecture at a central level and minimize the local development of several ICT platforms even if the development can be driven from a 'master local unit' which develops solutions for all local units. Different types of ICT implementations result in different kinds of service processes and customer interface changes (cf. EASY and built-in technology), so ICT should be seen as 'periods of organizational change' instead of technology installations (McAfee, 2006, p. 142); i.e. dynamic, not static.

Contributions and limitations

From a service management point-of-view, this study provides new insights into how technology enables new service processes and thereby explains that services do not necessarily fit into pre-defined service process interfaces. Instead, this paper illustrates that a dynamic view on service production is required as ICT enables not only new, information-based services but also already existing services to be performed in new ways.

The discussed ICT investments enable business innovations that strengthen competitiveness and enhance the customer service of organizations. Understanding the ICT possibilities in each of the four corners of the matrix (Figure 2) creates a basis for closer, reciprocal customer relationships in parts of the service portfolio whereas other parts work on formalizing and standardizing service processes. By this, ICT becomes a dynamic strategic development tool for business managers.

When interpreting the findings, the limitations of this study should be recognized. First, although access to key informants in the service organizations was avaliable, interviews with more ICT managers and application specialists could have possibly provided a more multifaceted understanding of the effects of ICT.

Second, the sample of subsidiaries selected is not representative of the subsidiaries of the firms. Both central and local managers considered the subsidiaries studied to be, if not the most advanced, at least above the average of the European subsidiaries in terms of usage of ICT in service production. Studying lead-users of new technology/applications is a way to predict future effects in situations where conclusions from randomly selected respondents will not capture the effects. Even if the transferability of the findings to less advanced subsidiaries or other regions of the world should be done with caution, transferability is an interesting issue that could be discussed in a future article.

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