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## **Technology as a Driver for Changing Customer-Provider Interfaces in Industrial Service Production**

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### **Introduction**

The trend in manufacturing firms towards the provision of services related to the produced goods has been highlighted by several authors (e.g. Henkel et al., 2004; Howells, 2004). Services can be critical for nurturing the customer relationship 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 operations of manufacturers it is not enough to focus on the internal service organization (e.g. front and back office) as the customer also is a source of product inputs (Hill, 1977), and a participant in the service production process (Grönroos and Ojasalo, 2004). New technology is an important driver for new offerings and Information and Communication Technology (ICT) applications can be used to improve manufacturing firms' existing service processes and develop new, more advanced services and solutions (Kowalkowski, forthcoming). 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 is insufficiently examined as most studies do not focus on B2B relationships (cf. Ritter and Walter, 2006) and if so, focus is often on product salesmen, not on service personnel (e.g. Hunter and Perreault, 2007; Ledingham et al., 2006; Tanner and Shipp, 2005). This paper fills this gap by exploring how ICT is affecting and driving changing service processes and customer interfaces of 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 the intra-firm and inter-firm interdependence patterns between organizational entities thus differ (Larsson and Bowen, 1989). Because value is co-created, customers themselves participate to

various degrees in the service production process and thereby influence their own satisfaction and perceived quality (Normann and Ramírez, 1993) and 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, customer willingness to participate is the extent the customer plays an active role in supplying inputs (e.g. personnel or information) to the service production process. In order to play an active role, customers have to prefer to produce the service themselves and/or they may feel that active involvement is necessary to guarantee quality. The provider can adapt to the customer characteristics both proactively, through new service designs, and reactively. During the last decade, many industrial enterprises have outsourced services previously produced in-house (OECD, 2005) and this being so, the disposition to participate in service production has been reduced in these firms and the provider has taken on a more comprehensive role.

Another important issue is the internal division between front office and back office, with various degrees of coupling, is. In order to better understand the different service production modes and internal coordination aspects, a contingency framework for studying the service production system and implications of process interfaces between service organization and customer, proposed by Larsson and Bowen (1989), is used. Because the model is originally adapted to a business-to-consumer context, the customer is described as one single entity only. In order to reflect the actual situation better the customer too should be described by front-office and back-office entities, the front-office entity being the employees having contact with the provider. Nevertheless, for exploring the service production process from the provider's point of view the original simplification with one customer entity is regarded as pertinent.

In this framework, concern is taken not only to the degree of customer participation but also to the uniqueness of customers' demand. This includes both the uniqueness of the customers' products/processes to be serviced and the uniqueness of the desired outcome. High diversity of demand refers to qualitative differences in demand whereas demand of 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) but a crucial difference is that this dimension represents external market conditions facing the firm. Subsequently, the firm can respond to these conditions with more or less customized service design. Consequences and implications of new ICT on the service production processes are of interest to discuss through this framework as it may affect the provider-customer interfaces and thereby have repercussions on the service offering's premises. Attention should not be limited to ICT that influence existing service processes but rather the provider should consider also using technology that enable 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 rebundled into new offerings with a denser level of resource integration (Normann, 2001). In addition, centralization and formalization are primary attributes of headquarters-subsidiary relationships (Ghoshal and Nohria, 1989) and thus also deserve attention.

### **Methodology**

The research process was an iterative process matching theory and reality, where advantage of the systematic combining of both the empirical world and the theoretical

models was taken (Dubois and Gadde, 2002). It is grounded in 'abductive' logic and can be characterized as going back and forth between the data and the theory, creating fruitful cross-fertilization. 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) access to key informants was possible. Eventually, the two multinational firms BT Industries (BTI) and ITT Flygt (Flygt) were selected for in-depth studies and the choice of firms was a deliberate research design parameter to ensure some degree of general applicability (Gummesson, 2000), and replication logic may be claimed (Yin, 2003). Accordingly, our findings are believed to apply also in other firms in moderately dynamic industries. Analysis of within-case data was made before cross-case analysis was initiated. The interviews were loosely structured with the help of an interview guide (i.e. a semi-structured approach). Respondents were presidents, service managers and other local managers at the Swedish, British, and Danish subsidiaries of BTI and the Swedish and British subsidiaries of Flygt as well as central managers within these firms. In total, 19 interviews and discussions, lasting between one and five hours, with 17 representatives took place. These were mainly central and local service managers but also sales managers, subsidiary presidents, and application specialists. Furthermore, intranets, internal documents, project meetings and workshops 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 €1.6bn (SKr14.67bn) as in 2005. The firm has 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 is service technicians. New technology is increasingly being built-in into the trucks and ever more specific software and ports is being required to serve them. Since 2002, EASY, a mobile business system is used in Europe. 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. Regarding 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. Secondly, focus is to sell more total Service Level Agreements (SLAs) and thirdly, to increase the number of Preventive maintenance SLAs. Another change is the increase in number of central agreements also comprising service, which makes it more difficult for both BTI and customers to compare and price.

#### *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. Sales amounted to €710m (SKr6.550bn) as in 2004. 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 an own service organization critical. In discussions with customers, it can be problematic to point at the offerings' monetized values as

Flygt then would have to know the customer's costs; something the customer himself often wholly does not know. Outsourcing, increased awareness of energy costs, etc. implies a possible increased role for Flygt both towards customers and towards actors like contractors and consultants. Too 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, LCC analysis, and other problem-solving and business-development services are examples of services produced with *reciprocal service design* (see Figure 1). Many new services are information-based, ICT being a prerequisite for them. For such services, close interaction and dialogue between provider and customer is required, and the co-creation of value plays a central role when both actors' cumulative knowledge and experience are harnessed to jointly create these services. For the provider, new reciprocal services help to create specialized skills and knowledge that later is codified and formalized so that it can be reused and offered to other customers, BTI's flexibility parameters in rental plans being an example of this.

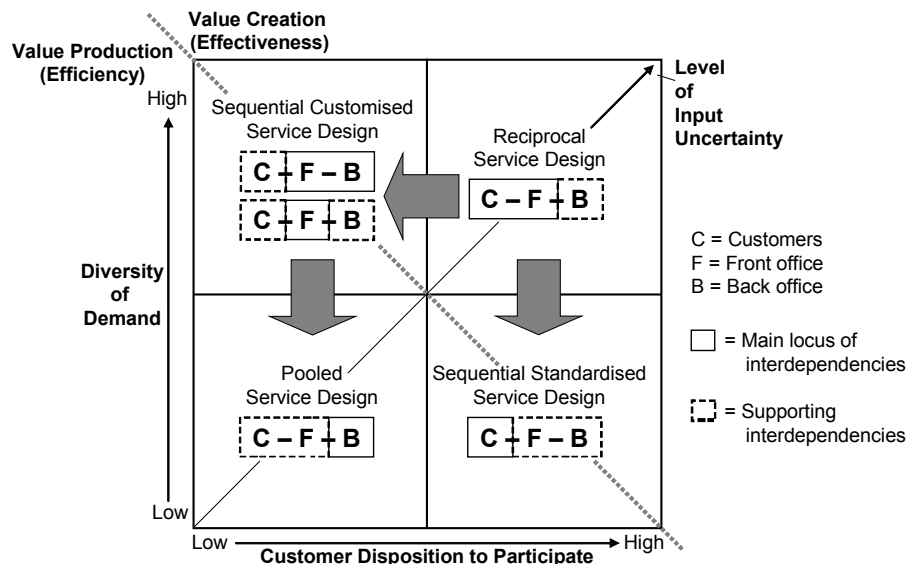


Figure 1. Changing interfaces in service production (based on Larsson and Bowen 1989, p. 221).

When formalized, many services no longer require the same reciprocity and dialogue and as routines are established, the services become sequential customized. As a result, service production is not necessary co-creation any more. It can also be co-production; i.e. no 'new' value is created (Ballantyne and Varey, 2006), rather existing service production processes are repetitive in nature (making and keeping promises) and thus standardized rather than customized. Thus, a diagonal is intersecting the level of input uncertainty in Figure 1 and value creation implies focus on effectiveness and sometimes unknown outcome whereas value production implies 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 resources (e.g. technical manuals) required 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 in interaction between provider and customer gradually become produced by one actor only in isolation from the other. 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 front office or through information systems.

Not only have new technology enabled more activities without direct customer contact; it has also enabled front-office personnel to substitute 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 main 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 coordination of service support are automated and/or eliminated, and *iii)* a decoupling takes place between front and back office. The customer's supporting 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 for a reciprocal service design. The partial decoupling taken place at BTI because of EASY implies that service technicians more seldom interact with back-office employees and Larsson and Bowen (1989) argue that spatially dispersed activities leads to risks of reduced service quality due to miscommunication. Even if the long-term effects have not yet been possible to estimate, so far however, the advantages have clearly outweighed the disadvantages in terms of both service quality and cost efficiency.

Technological advances affect both the goods traditionally manufactured and the related services. It is increasingly possible to replace both goods and service personnel's tasks through 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 of customers' outsourcing of service operations and therefore fewer dispositions to participate in the service production process but also because of ICT. Besides, reducing the output uncertainty (i.e. performance risk) and thereby improving

reliability and accuracy in the production is a driving force left and downward in Figure 1. In line with a development from customized to standardized service processes, a development from service designs facilitating high diversity of demand to designs facilitating low diversity take place. ICT applications and systems that enable new service processes, and not changes in external market conditions facing the providers in terms of decreased demand diversity as Larsson and Bowen (1989) suggest, is the explanation for the development directed downwards to pooled and standardized service design. Thus, this development takes place not because customers become more homogeneous (rather, there is an increasing diversity of demand) but because of technological advances and ICT implementations in the service organizations.

Particularly for 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 important to some extent. 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 new services to 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 international truck agreement. 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 outsourcing of industrial services, sequential standardized service design is probably the least common interface for these extensive 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 be a continuous need also 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 not fully or partially compatible with central and other local systems. However, increasingly, ICT need to be supported by central management commitment and not be left to individual subsidiaries to develop and implement. The central service organization is able to better allocate time and resources for new projects, especially large-scale ones. For example, BTI's EASY system would not have been possible for the BTI subsidiaries to develop. Although inputs from local management are also necessary, central coordination can enable technical standardization and more cost-efficient solutions, thereby achieving economies of scale.

The main obstacle to increased centralization has been disagreements and different interfaces between the firms' central service organizations and their subsidiaries. However, local managers believe that it is positive with increased centralization as long as centrally-developed systems facilitate the service organizations and enable them to allocate resources more efficient and effective 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. The endeavor to gain increased central control is clear in both the BTI and the Flygt case

and technology is the key that has enabled these centralization strategies. In order to achieve standardization of service processes and compatibility between information systems and between subsidiaries, more resources are allocated to ICT centrally. This implies a closer integration between central organization and subsidiaries as well as between subsidiaries (cf. Ghoshal and Bartlett, 1990). In addition, as more activities are coordinated centrally, a displacement takes place because the subsidiaries become a more refined front-office organization, while there will also be on a central level a certain number of front-office activities, particularly with regard to international customers.

### **Conclusions**

New ICT facilitates standardization, centralization (particularly of back-office activities), and formalization 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 the firms to implement many of the ICT applications and systems and as the firms are market leaders, automation should reduce input uncertainty, internal service-related costs, and relationship costs for the customer without eroding customer perceived quality. Thus, firms should balance between automation and interaction, and between efficiency and effectiveness 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 local back office is decreasing although the local-central integration has increased.

To an increasing extent, several service processes and designs have to be managed simultaneously, implying that new capabilities may be required. First, as the division between service and product offerings becomes ever more blurred (such as rental plans), front-office personnel have to act more proactive and work more integrative with product sales and vice versa. Second, the firms must manage the ICT architecture at central level and minimize the local development of several ICT platforms. However, the development can be driven from a 'master local unit' which develops solutions for all local units. Third, the local units must be given the freedom to customize their offerings, although based on the 'bits' of the common solution to limit the extent of costly, local customization. Finally, different types of ICT implementations result in different kinds of service process and customer interface change (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.

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