# Downstream shift at a machinery manufacturer: The case of the remote technologies

Teemu Laine*, Jari Paranko, Petri Suomala

Cost Management Center,
Tampere University of Technology,
P.O. Box 541,
FI-33101 Tampere, Finland,
E-mail: teemu.j.laine@tut.fi,
Tel.: +358 50 308 7049,
Fax: +358 3 3115 2027.
http://www.tut.fi/cmc/
**corresponding author*

## Abstract

**Purpose –** The objective of this paper is twofold. First, it aims at defining the concept of the downstream shift in the context of the machinery manufacturers. The second aim of the paper is to analyze the potentially enabling role of remote technologies in that shift.
**Design/methodology/approach –** Besides examining the development of the supply chains based on the literature and a case company, we refer to the case of the remote technologies developed and used by the case company for the years of 2003 to 2008.
**Findings –** The key finding of this paper is that no consensus exists on the favourable scope and content of the downstream shift aimed at by the machinery manufacturers. Respectively, the potential role of the technologies in the shift can also vary on a case-by-case basis. Based on the case study, instead of new sources of service revenues, the information processed with the help of the remote technologies may provide an opportunity for the machinery manufacturer to learn from its customers, thus offering a sound basis for various R&D and sales and marketing activities.
**Research limitations/implications –** This paper can be considered as a pre-study towards understanding about the true drivers of the downstream shift and their success factors. Technologies constitute one enabler in the shift, and its potential roles, together with the context specific factors, require further attention.
**Practical implications –** The paper offers valuable insights into the development of the supply chains. Moreover, it takes a critical perspective on the positive expectations connected with the downstream shifts by the machinery manufacturers.
**Originality/value –** The longitudinal perspective to the case environment provides a sound basis for analyzing the development of the supply chain at hand.
**Keywords:** Downstream shift, Supply chain management, Technology development.
**Paper type:** Case study.

## 1. Introduction

The actual roles of the companies involved in the supply chains tend to vary significantly. Traditionally, the Transaction Cost Economics (TCE) theory has said to have explanatory power over the optimal set of activities of a single company (see e.g., Williamson 1975), based on the analysis of the transactions within a particular supply chain. On one hand, a company may select complete vertical integration, which means that the company is responsible for all the activities from the refinement of the raw materials to the delivery of the end products to the customers (cf., Montewerde and Teece 1982). On the other hand, the company may focus narrowly on its so-called core competences and perform only a limited set of activities such as assembly and delivery of the end product (see e.g., Prahalad and Hamel 1990).

A focal concept in this paper is a "downstream shift" aimed at by the machinery manufacturers within their supply chains. The downstream shift refers to a phenomenon within the supply chains, which consists of two phases: 1) the machinery manufacturers outsource certain activities to their suppliers, and 2) the same machinery manufacturers persuade their customers to outsource certain activities to them. In other words, the downstream shift is about moving the position of the machinery manufacturer within the supply chain towards the customer network. In this paper, more particularly, the focus is on the latter phase of the shift.

The idea of the downstream shift was described by Wise and Baumgartner (1999), who studied the manufacturing companies who had been successful in their aim to get new tasks from their customer network. The focus of Wise and Baumgartner (1999) was on the distribution and the after sales of the machinery. The main result of the study was that there is a significant set of activities that can actually be taken over by the manufacturers regarding their machinery. However, the optimal division of tasks among the parties involved remains context-specific. Recently, some concerns have been presented regarding the success of such downstream shift. Although ambitious objectives have been set in terms of growth and profitability, only a few machinery manufacturers have met those objectives (Gebauer et al. 2005). The large-scale change is stated to be impossible with only small-scale actions taken by the manufacturers (Brax 2005). The strong roots of many machinery manufacturers as goods-producers may hinder the change away from the strict machinery orientation (Gebauer et al. 2005). The new activities aimed at by the manufacturers, such as after-sales and business consultancy services, can easily be described as relatively new to the manufacturers (Laine 2009).

The existing literature recognizes the outsourcing phenomenon, increased attention to the customer needs, and the technology development as drivers for the downstream shift among the manufacturers and the "servitization" of business in general (cf., Vandermerwe and Rada 1988, Mathieu 2001). As the profits of the pure machinery sales have decreased, sources of growth and profitability have been sought from the customer network (Vandermerwe and Rada 1988). As a result, the machinery manufacturers search

for new activities to be undertaken for the customers, thus bringing new sources of revenues for the machinery manufacturers themselves.

Regarding the technology development, the costs of the gathering, the refinement and the distribution of information and knowledge has decreased significantly during the last decades. As a result, the processes of information and knowledge management may constitute a remarkable source of competitive advantage for the companies (Spender and Grant 1996, Maier 2002). In relation to the machinery manufacturers, the information about the production and the maintenance of the machinery in use among the customers may provide the manufacturers with the possibility of taking better care of their active fleet. The size and the nature of the active fleet represent a factor that affects the after-sales business potential of the manufacturer (cf., Wise and Baumgartner 1999). In this paper, the focus is on the technology development as a driver of the described downstream shift. More particularly, it can be asked what information can be gained with the help of the new technologies that can enable the downstream shift. In other words, what is the (potential) role of the technologies in the downstream shift, aimed at by the manufacturers?

The objective of this paper is twofold. First, it aims at defining the concept of the downstream shift in the context of the machinery manufacturers. This part of the paper leans on the examination of the history of the supply chains based on the literature and one case company. The second aim of the paper is to analyze the (potential) role of technology in the downstream shift aimed at by the machinery manufacturers. As a case example, we refer to the remote technologies developed and used by the case company during the years of 2003 to 2008. Altogether, the authors of this paper have cooperated with the case company for up to 20 years, and have therefore been able to produce an exceptionally rich data regarding the history of the company and the particular technology at hand. The conducted analyses are based on, for example, semi-structured interviews, participatory observations in meetings, and analyses of the company's documents and databases.

## 2. The downstream shift as a unit of analysis

### *2.1 History of the supply chains in the background of the downstream shift*

The idea of the specialization has explanatory power over almost all the changes that have taken place in the supply chains. Adam Smith, in *The Wealth of Nations* (1776) pinpoints the specialization as a source of the comparative advantage of the nations. True wealth lies in the productive capacity. To increase wealth, a country must increase productive capacity, or efficiency. For Smith, the most potent potential source of increased efficiency was specialization; what he called the division of labor. The subdivision of tasks saves time, increases the level of skill, and leads to innovation (McEachern 1991, p. 42). The idea of the specialization is a basic idea of Transaction Cost Economics (TCE) (e.g., see Coase 1937, Williamson 1975), which explains the existence of specific companies and yet, the optimal division of labor between the companies. This ideology can also be read widely in the strategic management literature,

focusing lately on core competencies of the companies, for instance (Prahalad and Hamel 1990, Quelin and Duhamel 2003).

During the last few decades, many significant changes have taken place in the division of tasks within the industrial supply chains (Lummus and Vokurka 1999, Lonsdale and Cox 2000). By analyzing the changes taking place in a particular supply chain, one may approach the maturity of a single company or the entire supply chain. At an early stage of the industrialization, for instance, the companies were local, but self-sufficient. Besides managing the factories, the companies owned apartments for the labor, provided day care for the children of the labor force and even managed fire stations and churches in their area. During that time, there were few services available for the labor force, and the companies needed to be responsible for the development of the whole community. Since then, several changes have taken place in the industrial supply chains. The major changes can be identified in the literature (cf., Williamson 1975, Lummus and Vokurka 1999, Bowersox et al. 2000) and are described here from the viewpoint of the focal company (here: the machinery manufacturer) of the industrial supply chain:

1) The companies begin to concentrate on the activities that are directly related to the companies' business. The labor is replaced by machinery and some automation takes place.
2) Certain production phases are given to the suppliers. The automation of the processes continues as more flexible production machinery becomes available.
3) Only the assembly phase and the manufacturing of special components are undertaken by the machinery manufacturer itself.
4) Also, the assembly phase is partly outsourced to the supplier. Some peripheral activities (e.g., maintenance, real estate management) are outsourced externally to the manufacturing (Alexander and Young 1996).
5) The number of suppliers is reduced and the selected suppliers get the status of a system supplier.
6) The machinery manufacturer starts to focus on its customer network and is willing to persuade its customers to outsource certain activities to the machinery manufacturer (e.g., Anderson and Narus 2003, Wise and Baumgartner 1999, Oliva and Kallenberg 2003).

Regarding the downstream shift, some machinery manufacturers were already, a few decades ago, willing to focus on the assembly and the, for example, distribution of their products, whereas certain production phases were outsourced to the system suppliers. Recently, many of the machinery manufacturers have announced strategies, according to which they will become the specialists in the maintenance or even in the use of their machinery among their customers. As noted, many machinery manufacturers have begun to look at the customer network to find new business opportunities. This phase is referred to as a *downstream shift* in this paper (cf., Wise and Baumgartner 1999), which denotes a situation in which the machinery manufacturer both outsources certain activities to its supplier network and seeks new activities from its customers (see Figure 1).

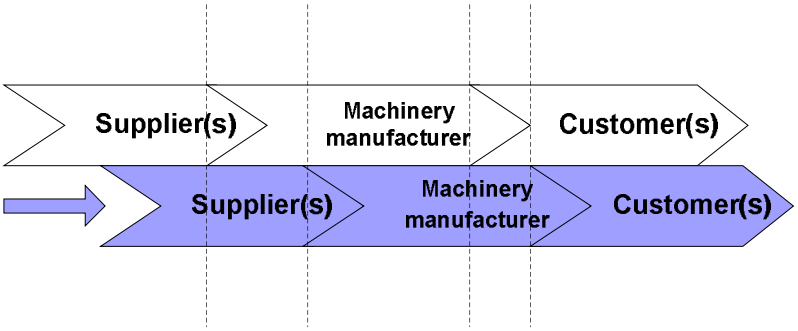


***Figure 1. The downstream shift aimed at by the manufacturers.***

The outsourcing phenomenon, increased attention to the customer needs, and the technology development as drivers for the downstream shift among the manufacturers deserve further attention. The recognition of such drivers gives the idea of an increased demand of such a downstream shift: The customers are willing to outsource certain activities and, thanks to the technology development, the machinery manufacturers can take over those activities. However, the justification of the downstream shift is based on the viewpoint of the machinery manufacturer itself, whereas the specification of the actual customer needs remains unstudied (cf., Brax 2005). Besides the challenges inside the machinery manufacturers, another remarkable challenge in the downstream shift is the fact that the underlying customer needs have not been examined in a sufficient manner. From the viewpoint of the opportunism of the machinery manufacturers, the downstream strategy of the machinery manufacturers seems to be due to at least two explanatory factors. First, the customer network is widely seen to represent an opportunity for profitable growth to the machinery manufacturers (e.g., Vandermerwe and Rada 1988, Mathieu 2001). Second, as pointed out recently, the machinery manufacturers are afraid of losing manufacturing activities to the low cost countries and are willing to look at new business opportunities outside the traditional manufacturing activities. The downstream shift seems, however, to be at a relatively early stage among many machinery manufacturers, which causes the mismatch between the objectives and the achieved results (Laine 2009).

### *2.2 The scope and the contents of the aimed at downstream activities*

It is noteworthy that the actions that have been taken by the companies are dependent on the major trends in a specific industry, in a specific area, at a specific time period. The new tasks aimed at by the machinery manufacturers may include, for example, spare part manufacturing and sales, the provision of various maintenance and warranty concepts, as well as training and business consultancy activities. However, the scope, the content and the economic vitality of the new activities needs to be examined on a case-by-case basis.

Wise and Baumgartner (1999) divide the scope of downstream service business into four categories: 1) embedded services, 2) comprehensive services, 3) integrated solutions, and 4) distribution control. In embedded services (e.g., in Honeywell), services are built into a physical product. A typical example is an information system that takes care of certain tasks (e.g., monitoring and troubleshooting) previously performed manually. With comprehensive services (e.g., in GE) Wise and Baumgartner (1999) refer to a situation

where the machinery manufacturer finances its customers or even takes care of certain operations. Integrated solutions (e.g., in Nokia) mean a combination of all the equipment and services a specific customer needs. In this option, the customer need is more present than in the previous alternatives. Distribution control (e.g., in Coca-cola) means taking over distribution activities and, as a result, gaining new business. The aforementioned different downstream strategies are overlapping in the sense of their scope. Depending on the industry and its structure, same service businesses can be positioned into various categories. However, this categorization may make the intensity of the service strategies more concrete. The existence of the positive examples may provide a sound benchmark for other companies.

Quite similarly, Oliva and Kallenberg (2003) discuss the extent of the service business of the manufacturers by exploring 11 manufacturing companies. They divided the service activities of the manufacturers into product related services (e.g., spare parts and maintenance) and end-user related services (e.g., training, consultancy, and even managing the production process). The four levels of service business are: 1) consolidating product-related services, 2) entering the installed-base service market, 3) expanding either to relationship-based services or process-based services, and 4) taking over end-users operations. The actual contents of the four categories are, however, interpretive and overlapping in nature. All the after-sales products, for instance, might be interpreted as installed-base services, as process-based services or as crucial end-user operations.

Obviously, manufacturing companies have noted the huge after-market potential in their customers' industries. The owner of a certain piece of machinery may expend 5-10 times more money on its lifetime operation compared with the purchase price of the machinery (Lindholm and Suomala 2007). The money is spent, for example, on energy, spare parts, wear parts, and other maintenance activities (Lindholm and Suomala 2005, see also Kuusisto and Meyer 2003). Another question is that of which portion of this business potential is really worth aiming at for the manufacturers. The manufacturers should not aim at a responsibility for all the activities (and related costs) of the customers' business, but selectively pursue those activities that could represent new profitable businesses for the manufacturers (Anderson and Narus 2003).

Typically, after-sales business is stated to be the most profitable business area of the manufacturers. Some companies may sell their machinery intentionally with a relatively low (or even negative) margin in order to get into the life-cycle business. Significantly, Suomala et al. (2004, p. 20) showed the variation in the life-cycle profitability of different industrial goods. In this case, some clearly unprofitable products were able to reach positive cumulative profitability (over ten years) due to related profits in the after-sales period, but there were also products which remained unprofitable even in the long run. Overall, the analysis revealed that after-sales business profitability was unevenly distributed over different products. In other words, micro-level analysis enriched the macro-level interpretation (the average spare part transaction has a 60 percent sales margin) quite remarkably.

The fundamental prerequisites of the downstream shift of a particular company can be analyzed in light of the Resource-based view (RBV). In the RBV, importantly, the competitive advantage of a company is based on the (heterogeneous) set of resources a company has in contrast to its competitors (Coase 1937, Penrose 1959, Williamson 1975). Here, the resources are interpreted pretty widely to cover all the goods, people, information, capital, energy and rights that a company has (cf., Seppänen 2008, Laine et al. 2006, Laine 2009). To constitute a competitive advantage the resources need to be valuable, rare, inimitable and/or non-substitutable (VRIN) (Eisenhardt and Martin 2000).

This paper focuses mainly on the information as a resource gained with the help of the new technologies. The so-called knowledge-based view argues that the gathering, the refinement and the distribution of information may constitute a remarkable source of competitive advantage for the companies (Spender and Grant 1996, Maier 2002, see also Vargo and Lusch 2004, "the application of the specialized skills for the benefit of another entity…"). In this paper, the importance of the information resources as a source of competitive advantage is not compared with other resources, but the aim is to describe what the information gained enables for the machinery manufacturers. In this paper, it is assumed that the companies are able to take advantage of the information gained, although the resources themselves do not force the changes to happen (cf., Penrose 1959).

The technologies under examination in this paper concentrate on the machinery in use among the customers. In other words, by using the technologies, the companies may be able to gain information about the production and the maintenance and the use conditions of their active fleet among the customers. As a result, the new information gained can be used as an input either in the existing processes of the machinery manufacturers or in the development of a new series of activities. Importantly, even the successful use of the information gained does not necessarily mean completely new sources of revenues for the machinery manufacturers. Despite the aim of the machinery manufacturers to go downstream, the pure machinery sales may still remain as the key source of revenues for the machinery manufacturers. In this case, the role of the new resources/activities, enabled by new technologies, might primarily lie in learning from the customers' business. The new knowledge concerning the customers' business could then be used in the development of the current products of the company. Moreover, if a machinery manufacturer developed new machinery that fulfills the customer needs far better than the previous products – or far better than the competitors' products – it gains competitive advantage and it can survive at least temporarily from the pressure of the machinery manufacturers located in low cost countries, for instance.

In sum, the existing literature focusing on the potential benefits of the downstream business to the machinery manufacturers, describes merely the economic consequences of the traditional after-sales business through a couple of international success stories. However, we largely share the idea of Araujo and Spring (2006), who state that "recent contributions suggesting that the balance should be swung towards [downstream] have shied away from examining why, how and when particular product–service combinations should be deployed to address particular types of demand." Answers to the aforementioned questions seem to require in-depth knowledge about a particular supply chain and its evolution. Quite remarkably, in-depth analyses of the downstream shift

attempted by the machinery manufacturers towards service business are still lacking. More specifically, although technology development has been recognized as a driver of the downstream shift of the machinery manufacturers, the role of new technologies in the downstream shift, as a potential source of competitive advantage, needs to be properly addressed.

## 3. Downstream shift in the case environment

### *3.1 History of the case company*

The history of the case company dates back to the 1940s. After the Second World War, no equipment or spare parts in a particular industry were imported to Finland. Therefore, the gunsmiths of a traditional manufacturer needed to learn new tasks and began to develop spare parts – and after a while, entire machines – to the domestic customers in this industry. The first machinery model was announced in the 1950s and soon the internationalization of the company began. The growth was drastic and by the end of the 1970s, the company had reached the status of being among the two major players in the industry in the entire world. At this point, the assembly of the machinery was undertaken by the six assembly units all over Europe. Analogously, to the fast growing economies in Asia, the company started as a "pirate" spare part manufacturer.

At the moment, the case company provides its customer with machinery and after-sales services in global markets. Revenues outside pure machinery sales have reached the level of 40%, which is typically interpreted as a signal of major advances in the downstream shift (see e.g., Gebauer et al., 2005). During the research process, the number of the company's personnel almost doubled and the growth in revenues was even faster than that, mainly due to the global boom in machinery sales.

The comparative advantage of the company is that for its entire life, it has attempted to understand the markets and its customer needs, and it has had the ability to take advantage of the knowledge and skills available in the company (a history of the company, published in 1981). Recently, these characteristics have been written down as the basis of the new service strategy[1] of the company. Similar to many other machinery manufacturers, the key words in the official strategy of the company have, since 2000, been "closer customer relationships" and "the value creation process of the customers". According to the key personnel of the company, service business was recognized as a strategic issue in the company a decade ago. Seeing the company as a productivity partner of its customers is the most recent way of thinking.

The development of the supplier network of the company follows the major trends in the supply chain development in Finland. In the company, the outsourcing phenomenon began two decades ago. By the end of the 1990s, even part of the final assembly of the

[1] Service strategy is here interpreted as an entity that comprises of the official documents of the company and the objectives and expectations of the managers, stated unofficially. Service strategy is not a well-defined set of business objectives, but more readily a loosely coupled set of future expectations of the individuals. During the research process, the interpretation of the service strategy of the company has evolved substantially.

machinery was outsourced. During the last decade, R&D and purchasing have also been partly outsourced. Due to the outsourcing phenomenon, the number of suppliers increased to the level of 500, and the supplier network became less manageable. In order to gain a comparative advantage, there was a need to develop the most important supplier relationships into partnership relationships. By the beginning of the 2000s, the number of suppliers decreased dramatically and the key suppliers reached the status of system suppliers.

Besides the outsourcing phenomenon, the company has been turned into a global company, which distributes its products through over 50 subsidiaries and over 100 dealers. A recognized challenge is to develop the multi-phase distribution network to additionally serve the new strategy of the company and also to deliver the new activities to the customers which are currently under development in the company. Significantly, the company was reorganized from 2004 to 2005. The former structure based on machinery factories and a spare parts division was replaced by a model which gathers all units under each customer segment. The company is keen to develop an image of a comprehensive system supplier among its customers. At the moment, the reorganization is still ongoing.

### *3.2 Towards the downstream shift in the case company*

The aim of the downstream shift, which can be read in the annual reports of the company, is at a relatively early stage in the company. In general, the results attained so far in the change towards service business are not as impressive as the literature may suggest (see e.g., Wise and Baumgartner, 1999, Anderson and Narus, 2003). This seems to be due to two reasons: 1) The downstream shift includes topics and tasks that are relatively new to the company; 2) The actualization of the downstream shift is not a highly prioritized activity for the company, for example, due to the peak in machinery sales, and therefore, has not yet been sufficiently resourced or systematically managed.

Essentially, any change process requires significant effort inside the company. If the company aims at going downstream, the natural resistance to change in the company should also be taken into account. Some managers expect that the developed new technologies will lead to dramatic changes in the business environment. The case company has strong roots in machinery manufacturing, and therefore, the resistance to a change towards – what is perceived as more “soft” and “fuzzy” – downstream business seems to be exceptionally high among the personnel of the company.

In order to enable the downstream shift, the company has, for example, developed a couple of service technologies, including remote technologies, a training simulator and a couple of simulation tools. Quite naturally, the development and the use of such technologies have been affected by the history of the company and the most important characteristics of its business environment. On the other hand, the actualization of such important projects has significantly affected the downstream endeavours of the case company.

### *3.3 An overview of the remote technologies*

This section describes the remote technologies at hand in the company, developed from 2003 to 2008. The background of the development of the remote technologies was a technology push and a need to respond to the competitors' development efforts. One decade ago, a vision of the machinery network in the future was presented by the R&D managers of the company. Every single piece of machinery would be connected to a global information network that would potentially provide several business opportunities. Essentially, the costs of gathering and processing data had recently dramatically decreased and the competitors of the company were known to be developing similar machinery networks. Meanwhile, a project to develop a new, intelligent machinery generation, equipped with advanced automation systems and new information and communication technology, was launched in the company. The potential synergies between the two projects were seen as significant, although as yet were more or less unknown.

In the upcoming machinery generation, a piece of machinery will be controlled with the help of a computer. The control will be supported by information about the status of the machine, collected by several sensors. Both the current status of the machine and its use history will be available for, say, the user of the machine. The remote technologies, in particular, enable collecting the production data, the cumulative engine hours and the location of the machinery. Moreover, the remote technologies enable the remote diagnosis of the machinery, if the status information is sent to the server of the company. At the moment, the next machinery generation is in the ramp-up phase. Two pilot versions of the remote technologies installed in the previous machinery generations have already been in use among the customers; the first pilot being in 2004 and the second one in 2007. These pilots have been given to the customers free of charge.

Initially, some of the managers wanted to sell the remote technology as one feature of the machinery and placed the emphasis on the direct revenues from the technology. Some managers highlighted the possibility of steady cash flows from the technology by invoicing for the use of the technology on a monthly basis. During the pilot phase, the company collected feedback from the pilot customers. Some customers were worried about whether their competitors would gain access to the collected data. For those customers, the (potential) price of the technology was not easy to explain: "Why should I pay for such data that I have not needed and that may eventually be used against me?" However, the use of the technology had already increased the credibility of a small customer, for the output of the machinery could objectively be shown to their customers. Moreover, the engine hours and the location information helped the larger customers with several units of machinery to optimize the usage and the maintenance of their machinery.

However, besides the direct revenues to the machinery manufacturer, the remote technology could serve as a source of indirect benefits. Already during the pilot phase of the project, the company gained access to very interesting data. After the first pilot, the researchers placed the emphasis on the internal use of the information collected to get to know the customers' business. With the help of the technology, the front-line marketing of the company, for instance, may be able to analyze the customers' business in order to gain machinery sales and recapture the after-sales market. Moreover, this accumulated

knowledge may help the company to develop new types of machinery that more accurately meet the specific customer requirements. So far, quite surprisingly, only the people directly involved in the development of the technology have been interested in the collected data. So far, the technology has not yet yielded revenues or remarkable indirect benefits. At the moment, the company is taking its first steps to systematically recognize and take advantage of the opportunities provided by the service technologies.

### *3.4 The remote technologies as a learning tool in the downstream shift*

The remote technologies represent new activities to the company, including collection, storing, distributing and utilizing the collected data all around the world inside the company. At the moment, the actual contents of those new activities remain unknown. The actual remote technologies developed during the project, including the hardware, the software and the communication technologies are the basis for the process. Recently, the company established a new team that will take care of the remote technologies, that is, the further development of the technology and the use of the technology for business purposes. In this section, the new activities are examined in a more detailed manner.

In this paper, the unit of analysis is a set of machinery that is connected to the network and is in use at the customers' premises. However, there are several alternative ways to interpret the key process utilizing the data, collected by the remote technologies. Obviously, a part of the process is about collecting location, engine hours, and production data for the database of the company. On one hand, the utilization process is about using this data provided by the customers for various purposes. On the other hand, from the viewpoint of the manufacturing company, the process is about learning from the use environment of the machinery enabled by the collected data.

During the two pilots, some useful outputs of the remote technologies to the customers were identified. The data may be used both for increasing the operative productivity of the customers and for long-term oriented business development. As noted, the collected engine hours and production data could be used to increase credibility when selling projects to the end customers. The location information could be used by the customers themselves (or the maintenance personnel of the manufacturing company) in order to more easily find the mobile machinery in order to perform the needed maintenance activities. As noted, however, the attitude towards the technology and its potential benefits varied among the customers.

From the viewpoint of the company itself, the information processed with the help of the remote technologies may provide an opportunity to learn from the customers. It is noteworthy that the development of the remote technologies has required substantial development costs. The management seems to be willing to cover those costs as soon as possible by selling the remote technologies in various forms to the customers. However, the technology enables a collection and utilization of data, which might also be valuable to the manufacturing company itself both to increase its operative efficiency and gain certain strategic benefits. The potential benefits from this process include the following scenarios:

1) The use of the location data and the engine hour data might help the company to develop its proactive maintenance activities. The remote diagnosis may help in the identification of certain problems during the use of the machinery. In the future, certain failures of the next machinery generation might even be corrected by loading updates from the network. The proactive maintenance activities are not necessarily new to company, but the technologies may help the company to take those activities into action. The technologies have not yet, however, taken advantage of in terms of issues such as proactive maintenance.

2) The remote technologies may provide the manufacturing company with an opportunity to learn from the use of the machinery in the customers' process in various environments (cf., double-loop learning, Argyris (1995)). The remote technologies might yield a global information system that would gather data from the machinery of different customers, different countries and different customer segments. The analyses based on this information system may be valuable for a number of internal purposes including R&D and sales and marketing activities. a) Useful information might be accumulated for the further development of the machinery of the company. A prerequisite for such an information system is, however, that a substantial proportion of the active fleet is connected to the information system and there are clear procedures as to how information is used in the company. b) If the production figures of a customer immediately collapsed, as an example, the company gets an "early signal" of this. As a result, the sales manager might be able to identify the reasons underlying this and to take the needed actions. If the customer profitability information was connected to these production figures, a key account manager would get a fairly comprehensive view on each customer and might be able to actively develop the customer relationships.

It is noteworthy that the technology would enable this kind of global information system that is potentially valuable for various purposes. However, the procedures regarding such an information system cannot be developed that easily. Moreover, the potential users of such an information system have not yet become that interested in the potential benefits of the remote technologies. Although the utilization of the remote technologies refers merely to the development of the internal procedures of the company itself, there seems to be significant challenges hindering the full scale use of the technologies for those purposes.

## 4. Discussion

The first aim of this paper was to define the concept of the downstream shift in the context of the machinery manufacturers. Second, the potential role of the remote technologies in the shift was discussed based on the empirical experience.

In this paper, the downstream shift refers to a phenomenon, which consists of two phases: 1) the machinery manufacturers outsource certain activities to their suppliers, and 2) the same machinery manufacturers persuade their customers to outsource certain activities to them. The downstream shift is quite often connected to the "servitization of business" as a timely research area (see e.g., Vandermerwe and Rada 1988). Based on the literature, however, the actual scope and the content of the shift towards the customer network tend

to vary and no consensus exists about the drivers of the success of the downstream activities in a particular context. The existing categorizations of the downstream activities seem to overlap and blur (cf., Wise and Baumgartner 1999, Oliva and Kallenberg 2003). Moreover, the list of the enablers and/or success factors of the shift (e.g., technology) remains incomplete (cf., Wise and Baumgartner 1999).

In the case company during the last decade, various expectations have been connected to the downstream activities. On one hand, it seems that the aim of the downstream shift is not that clear: the projects focusing on the new downstream activities are treated as secondary ones. On the other hand, the necessity of the downstream shift has remained unquestioned in the case company (cf., Araujo and Spring 2006). So far, the actions taken have not turned into new sources of revenues or profits, as was earlier expected in the company.

As conveyed in Figure 2, the customers have not (yet) outsourced any major activities from their value chain to the machinery manufacturers. However, the new technologies, the remote technologies included, are seen primarily as platforms to learn from the customers' business in the company. Due to the technology development and growing interest in the customers' business, the machinery manufacturer is beginning to get access to the information about the customers' business. Based on the preliminary findings, it seems evident that the downstream shift requires learning completely new issues in order to become capable of taking over new activities from the customers. As a result, the information about the customers' business, that is, the customer needs and requirements, may turn out to be helpful both in the further development of the current products of the machinery manufacturers and in the R&D of completely new types of products to be offered to the customers.

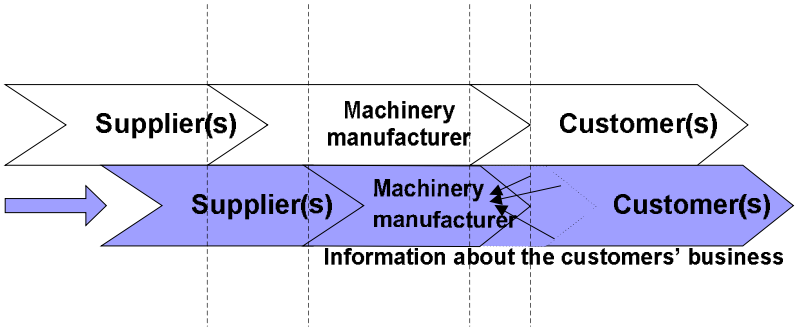


***Figure 2. The current interpretation of the downstream shift in the case company.***

The downstream shift is a phenomenon that has been initiated by the machinery manufacturers themselves (cf., Brax 2005). A technology push was identified, respectively, as a driver for the development of the remote technologies analyzed in this paper. Based on the preliminary findings, the remote technologies at hand in the company would provide a beneficiary mechanism to collect and utilize data concerning the customers' business, more particularly concerning the use environments of the machinery. However, the actual consequences of the remote technologies can be studied only after wider diffusion of the technology into the active fleet of the case company.

Despite the automated data processing, the use (and the usability) of the collected information for business purposes is still an open question.

The potential benefits of the remote technologies identified in this paper refer both to the operative efficiency of the machinery manufacturer and some strategic benefits. First, the operative efficiency may be increased if the remote diagnosis provides information for the maintenance personnel and enables proactive maintenance. Second, the development of the remote technologies may be seen as an investment in the R&D of the machinery of the company, if the data is to be systematically utilized as a part of the further development of the machinery. Third, one may use the collected data inside the company in order to examine the "early signals" concerning the customers. Altogether, the signals provided by the information system, including machinery utilization rates and trends in the production figures, might help the company in capacity planning, in its allocation of sales efforts, and in the R&D of the company.

At the moment, there is ample scope for further research. The downstream shift aimed at by the machinery manufacturers still seems to be widely in progress. The actual content of the shift and its consequences to the supply chains can be clarified no earlier than the possibilities enabled by the new technologies become clear to the parties involved. This paper can be considered as a pre-study towards understanding about the true drivers of the downstream shift and its success factors. Technologies constitute one enabler in the shift, and its potential roles, together with the context specific factors, require further attention.

## References


Alexander, M., Young, D. 1996. Strategic Outsourcing. Long Range Planning, Vol. 29, No. 1, pp. 116-119.

Anderson, J. C., Narus, J. A. 2003. Selectively Pursuing More of Your Customer's Business Sloan Management Review. Vol. 44. pp. 42-49.

Araujo, L., Spring, M. 2006. Services, products, and the institutional structure of production. Industrial Marketing Management. Vol. 35. pp. 797-805.

Argyris, C. 1995. Action science and organizational learning. Journal of Managerial Psychology. Vol. 10. pp. 20-26.

Bowersox, D. J., Closs, D. J., Stank, T. P. 2000. Ten Mega-Trends that will revolutionize supply chain logistics. Journal of Business Logistics. Vol. 21. No. 2. pp. 1-16.

Brax, S. 2005. A manufacturer becoming service provider - challenges and a paradox Managing Service Quality. Vol. 15. pp. 142-155.

Coase, R. H. 1937. The Nature of the Firm. Economica, New Series. Vol. 4. pp. 386-405.

Eisenhardt, K. M., Martin, J. A. 2000. Dynamic Capabilities: What are they? Strategic Management Journal. Vol. 21. pp. 1105-1121.

Gebauer, H., Fleisch, E., Friedli, T. 2005. Overcoming the Service Paradox in Manufacturing Companies.European Management Journal. Vol. 23. pp. 14-26.

Kuusisto, J., Meyer, M. 2003. Insights into services and innovation in the knowledge intensive economy. Technology Review 134/2003. TEKES, National Technology Agency. Helsinki, Finland 63 p.

Laine, T., Paranko, J., Suomala, P. 2006. The Nature of Services in B2B Context. The 13th International Annual Conference of EurOMA, Vol. 2, pp. 887–896.

Laine, T. 2009. Exploring pilot projects of a manufacturer on service R&D to understand service as an accounting object. Dissertation. Tampere University of Technology.
Lindholm, A., Suomala, P. 2005. Present and Future of Life Cycle Costing: Reflections from Finnish Companies. The Finnish Journal of Business Economics. Vol. 54, pp. 282-292.
Lindholm, A., Suomala, P. 2007. Learning by costing: sharpening cost image through life cycle costing? International Journal of Productivity & Performance Management, Vol. 56. No. 8. pp. 651-672.
Lonsdale, C, Cox, A. 2000. The historical development of outsourcing: the latest fad? Industrial Management & Data Systems. Vol. 100. No. 9. pp. 444-450.
Lummus, R. R., Vokurka, R. J. Defining supply chain management: a historical perspective and practical guidelines. Industrial Management & Data Systems. Vol 99. No. 1. pp. 11-17.
Maier, R. 2002. Knowledge management systems: information and communication technologies for knowledge management. Berlin. Springer cop. 574 p.
Mathieu, V. 2001. Service strategies within the manufacturing sector: benefits, costs and partnerships. International Journal of Service Industry Management. Vol. 12. pp. 451-475.
McEachern, W. A. 1991. Economics: A contemporary introduction, South-Western Publishing, Cincinnati. 919 p.
Montewerde, K. Teece, D. J. 1982. Supplier Switching Costs and Vertical Integration in the Automobile Industry. The Bell Journal of Economics. Vol. 13. No. 1. pp. 206-213
Oliva, R., Kallenberg, R. 2003. Managing the transition from products to services. International Journal of Service Industry Management. Vol. 14. pp. 160-172.
Penrose, E. 1959. The theory of the growth of the firm, Basil Blackwell, Oxford.
Prahalad, C., Hamel, G. 1990. The Core Competence of the Corporation. Harvard Business Review. Vol. 68. pp. 79-91.
Quelin, B., Duhamel, F. 2003. Bringing Together Strategic Outsourcing and Corporate Strategy: Outsourcing Motives and Risks. European Management Journal. Vol. 21. No. 5. pp. 647–661.
Seppänen, M. 2008. Business Model Concept: Building on Resource Components. Dissertation. Tampere University of Technology.
Spender, J-C, Grant, Robert, M. 1996. Knowledge and the Firm: Overview. Strategic Management Journal, Vol. 17, pp. 5-9.
Suomala, P., Lyly-Yrjänäinen, J., Paranko, J. 2004. Kannattavuutta kohti, matkakertomuksia lukujen takaa. Helsinki. Teknologiateollisuus ry. 96p. (in Finnish)
Vandermerwe, S., Rada, J. 1988. Servitization of business: adding value by adding services European Management Journal. Vol. 6. pp. 314-324.
Vargo, S. L., Lusch, R. F. 2004. Evolving to a New Dominant Logic for Marketing. Journal of Marketing. Vol. 68. pp. 1-17.
Williamson, O. E. 1975. Markets and Hierarchies: Analysis and Antitrust Implications. The Free Press, New York. 286 p.
Wise, R., Baumgartner, P. 1999. Go Downstream: The New Profit Imperative in Manufacturing. Harvard Business Review. Vol. 77. pp. 133-141.

## Biographical notes

***Teemu Laine*** received a Dr. (Tech.) in Industrial Management and Engineering in 2009. He completed his dissertation focusing on the infusion of services into manufacturing. Currently, he works as a senior researcher for the Cost Management Center (CMC) research team at Tampere University of Technology.

***Jari Paranko*** holds a Lic.Tech. degree in Industrial Management. He is the founder of the Cost Management Center (CMC) research team at Tampere University of Technology. In the last decade, he has been the director of several research projects in the fields of Management Accounting, Cost Management, and Enterprise Networks.

***Prof. Petri Suomala*** holds a Dr. (Tech.) in Industrial Management and Engineering. He is the professor of (Management) Accounting and Business Administration as well as the director of the Cost Management Center (CMC) research team at Tampere University of Technology. His current research interests include (Life-cycle) Cost Management and Management Accounting, as well as their utilization in industrial companies and other organizations.

## Acknowledgements

The research projects resulting in the paper at hand have been funded by the Academy of Finland and the Center for Technology and Innovation in Finland (TEKES), which is hereby acknowledged. The authors wish also to thank the case company for granting access to the fruitful data set.