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Exploring Service System Resources: The Role of Technology

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Abstract

*This paper traces a firm's transition from goods-dominant to service-dominant logic using a remote monitoring system. By adopting a service system perspective and tracing its main resources involved in value creation, we have examined the value propositions that are brought forth, and the roles the different resources play. We have shown how the introduction of a new technology in the form of an RMS has a potentially strong impact on the other three resources in the service system; **organization**, by grounding service processes in data collection and analysis; **people**, through changing trust relationships; and **shared information**, by becoming the system's language, laws and measures. Thus, by paying specific attention to technology, we may also see and work with its potential.*

1. Introduction

In the past decade an increasing number of manufacturing firms have developed their service business, for example IBM, General Electric and Rolls Royce. Suppliers of products from diverse industries such as information technology systems, aircraft engines and telecom systems have succeeded with this approach by delivering innovative combinations of products, technology and services as high-value unified responses to their customers' needs [8]. For these manufacturers, products have evolved into a platform, enabling integration of a wide-ranging set of services to meet customers' requirements [2].

Service production comprises an ongoing exchange of immaterial assets between a supplier and a client [9, 22]. This shift in focus from products to services has been defined in the marketing literature as transitioning from a goods-dominant (G-D) logic to a service-dominant (S-D) logic [15, 31, 33]. Building on S-D logic is the service science approach, which studies service systems and especially how complex configurations of resources create value within and

across companies [26]. Service science intends to focus scientific attention on problems connected with innovating service and increasing service provision [7, 28]. Service systems include service providers and service clients functioning together to coproduce value in complex value chains or networks [30].

Previous research has also shown how the use of a remote monitoring system (RMS) can help a manufacturing firm shift focus from the production of goods to the production of services, with data logging and analysis serving as the foundation of the service offer [37]. However, the ongoing shift from G-D to S-D logic has so far received little attention in information systems research in spite of the near connection to, and assumed contribution of information technology (IT) [3]. Jonsson [11] points out that the field would benefit from additional studies of IT-enabled services and argues that further studies are needed, to better understand the implications of IT in services, for instance what new knowledge and skills are necessary, how IT affects the provider-customer relationship and what new digital business processes IT facilitates.

Against this background, we have formulated our research question: *What is the role of remote monitoring systems in the transition from a Goods-dominant logic to a Service-dominant logic within the manufacturing industry?*

To address our question, we examine the case of Lumberjack, a manufacturer of forest machines that is in the process of creating new value adding services through the use of RMS. By exploring Lumberjack's process of service delivery and studying their introduction of RMS in their service organization, we seek to visualize the dimensions of a service system and how the system is affected by the introduction of new technology. Furthermore we seek to explore the role of IT in this process in a transition toward developing more value-adding services.

2. Related Research

2.1 From a goods-dominant to a service-dominant logic

The change of focus from products to services has been defined as being a transition from a goods-dominant logic to a service-dominant logic [15, 31, 33]. The most important contrast between service-dominant and goods-dominant logic lies in the basis of exchange. G-D logic focuses on the exchange of operand resources (which an act is performed on, such as goods) whereas S-D logic focuses on the action of operant resources (those that act upon other resources) [6, 31]. In a G-D logic value is stated in exchange, while in a S-D logic value is stated in use [34].

In the G-D logic view, the object of economic exchange is to create and deliver objects to be sold. Value is embedded into a good during the firm's production process, and the value of the good is signified by the market price or what the client is willing to pay. Maximum efficiency and profit is achieved, from this perspective, through standardization and economies of scale [34]. In G-D logic, there is a distinction between the manufacturer and the client and their value systems, and value is created in a step-by-step, linear fashion [31]. As customers consume, they destroy value and must return to the supplier to have access to further value [34].

In contrast, the S-D logic views all exchange as based on service and that *"when goods are involved, they are tools for the delivery and application of resources"* [32, p.40], which implies that goods are service delivery vehicles [34]. Key resources for competitive advantage are knowledge and skills. In contrast to G-D logic, S-D logic states that value is at all times co-created with the client [33]. For S-D logic, value comes from the favorable use of operant resources, which are occasionally transmitted through operand resources or goods [31]. Thus, from this view, value is co-created by the mutual effort of firms, personnel, clients, stakeholders, government agencies, and other entities connected to any given exchange, but always decided by the receiver (e.g., customer) [34].

In transitioning from G-D to S-D logic it is also important to reflect upon the role of technology and the relationship between technology and people in the process. Previous research has shown that in order for technology-enabled industry developments to be successfully implemented in the clients' organization, it is significant that the supplier comprehends the perspectives of the client or else there is a risk that the service experience will be depersonalized by the use of technology and cause frustration for the customer [35].

2.2 Remote monitoring systems

Remote monitoring systems (RMS) collect, transmit, store and analyze data about a process or a product constantly [37]. Data can be captured and then passed on for analysis, by using sensors that register contextual data such as temperature, pressure or vibration frequency [24]. This permits alarms to be activated when unusual conditions are detected and for off-site technicians to observe variances in the gathered data to decide when product maintenance is needed. RMSs are increasingly being used within industrial firms to monitor products and enable maintenance from a distance [1]. Parameters for remote measurement in industrial applications include cutting forces, vibrations, motor current and acoustic emission. For each of the different parameters there are appropriate sensors that can be used [5].

Remote monitoring services are built on a preventive maintenance approach where errors are detected and items replaced before an actual breakdown occurs. From a manufacturing firm point of view, the collected data can be used to create services that amplify the customers' knowledge about their own processes [37, 38]. When providing maintenance-related services, one aspect is to improve the up-time of the clients equipment as failures in the maintenance and following breakdowns can cause loss in production and environmental risks [4]. These can be reduced if failures in the machines can proactively be predicted and corrected [11].

The increased focus on RMS-technology as being an important instrument in a manufacturer's transition to S-D logic highlights the importance of paying particular attention to the role of technology to comprehend its possible influence. Previous calls for being specific about IT imply that a certain technology has particular features that need to be reflected upon and studied in order to fully comprehend their impact [16, 18].

3. Theoretical Framework

3.1 Service systems

For service science a service is *"the application of competences such as knowledge and skills by one party for the benefit of another"* [34, p. 145] and a service system is *"an arrangement of resources (including people, technology, information etc.) connected to other systems by value propositions"* [34, p. 149]. The service system divides resources into four categories; people, technology, organizations and shared information. There are three types of shared

information; language, laws, and measures [27]. Systems would find coordination difficult without some form of language or standard encoding of information, which would lead to missed opportunities for innovation [19]. Laws and contracts are required when providing sophisticated service and continuing complex service systems. One type of measure of value of service exchange within or between service systems are prices, and often standardizing the set of measures increases the productive ability of the system [27].

These four categories (people, technology, shared information and organization) are important because they include resources as property, resources with rights, physical entities and constructed entities (see figure 1), meaning that the service system model can include a broad range of disciplines' views [15]. In a service system, at least one resource is an operant resource, specifically an individual with rights, and capable of interacting with and judging results [27].

	Physical entities	Socially constructed entities
Rights	People	Organizations
Property	Technology	Shared information

Figure 1. The resources in a service system (based on Maglio and Spohrer, 2008)

The service system resources have different sets of competences that are distributed among them, and the connection between the resources is the value propositions [15]. All service systems are both providers and clients of service, which are linked by value propositions in value chains, value network, or value-creating systems [17]. Service is performed in close interaction with a customer and the more knowledge-intensive and customized the service gets, the more the performance of service depends critically on the customers input and participation, whether by providing information, property or labor [25].

Service systems are connected through the proposition, acceptance, and evaluation of value [28]. Service providers propose value in the market based on their competences and capabilities. The value propositions are accepted, rejected, or go unnoticed by other service systems in need of resources. Once the value is proposed and the service made available in the market, it is the other service systems – potential customers, in need of such resources, who decide whether to accept the value proposition or not [34].

3.2 Value co-creation

The concept of value co-creation suggests a value system where manufacturer and purchaser in an interactive system generate value through the integration of their resources [14]. Co-creation further implies that value is recognized and determined by the client in use [10, 20, 23, 33]. Transferring the position of value creation from exchange to use, or context, means changing our understanding of value from centered on units of firm output, to centered on processes that integrate resources [34]. Developments in service innovation are only possible when a service system has information about the abilities and the needs of its customers, its competitors and itself [27]. Following that logic, a firm cannot produce and deliver value on its own; it can only offer value propositions [12]. A service system must dynamically adjust its value propositions to change to the shifting ecology of service systems [29].

Within a service system, there are some features that are fundamental in the creation of value. The four resources, people, organization, technology and shared information are bound together through value propositions, and through them, value is created. A summary of our conceptual framework connected to the process of value co-creation in a service system is shown in the table below:

Theoretical concept	What the concept captures
People	Physical resources with legal rights
Technology	Physical resource that is treated as property
Organization	Conceptual resources with legal rights
Shared Information	Conceptual resources treated as property The three types are language, laws and measures
Value proposition	Value proposed from the provider to the client

Table 1: Conceptual framework for co-creation of value in a service system.

4. Method

4.1 Research site

The study is based on a qualitative research approach in the form of a case study [36, 13] at Lumberjack Sweden, a manufacturer of forest machines. The research site was chosen because it offered access to multiple sources and provided an opportunity for purposeful data collection [40, 21]. Lumberjack had at the time of the study already used

the RMS Track for two years and was currently in the process of launching a new and more advanced RMS, Fleet.

Lumberjack is one of the largest forest machine manufacturers in the world and has its headquarters in Sweden. The products include harvesters, forwarders and harvest heads. However, Lumberjack has recently made explicit a new business strategy “Profit without sales”, indicating that the production of goods should no longer be the core business for the firm. The new focus lies on the delivery of services. Their customers exist on a global market, but this study focuses on the service and maintenance organization of Lumberjack Sweden. The service organization is divided into five regions. Each region has a number of service workshops and staff at the site includes mechanical-, technical-, spare-parts- and administrative personnel.

By implementing RMSs, Lumberjack intends to offer more value-adding services for their customers, build stronger, long-lasting relationships, and also improve their own service processes through transitioning from a more reactive to a more proactive maintenance approach.

Currently, most of the service is performed in the forest, where the clients and the machines are at work. With their RMS Track, the Lumberjack technicians have the opportunity to perform some maintenance services from a distance. Their forthcoming RMS Fleet enables the maintenance staff to collect and store operation and production data, which can serve as a foundation for Lumberjack to improve their own processes and enable a more proactive service delivery to their customers.

4.2 Data collection

Data was collected with a combination of techniques [40] including semi-structured interviews with selected respondents, firm meetings, observations at three service offices and studying documents from the after-sales division. These sources together form the empirical base of the study. There was an initial three-hour meeting with Lumberjack representatives from the after-sales division who discussed the current status of their RMSs and possible improvements for the future. Two two-hour meetings with the general manager of parts business, as well as two additional two-hour meeting with representatives from Lumberjack Sweden and after sales Lumberjack, were also conducted. During the meetings field notes were taken and question were asked.

To further increase our understanding of Lumberjack’s current service delivery, individual interviews were conducted with a person from Lumberjack headquarters, three region managers and

five staff members at the respective service office/repair shop, totaling nine interviews. The interviews were structured with a framework of questions concerning the maintenance processes, customers, and use of IT, their RMSs, and future service development. Most interviews were conducted on site, but two interviews were conducted by telephone. The interviews lasted between 20 and 105 min, with an average of 57 min. A majority of those interviewed had some prior experience of Lumberjack’s RMS and all interviewees were chosen in consultation with a contact person from the firm. All of the interviews were audio-recorded and then transcribed. In this study, the focus was solely on Lumberjack’s account of their process of changing their business logic from goods to service delivery and any accounts of customer reactions comes from interviewing Lumberjack staff.

4.3 Data analysis

The second author transcribed all of the audio-recorded interviews. All names including the firm’s have been fictionalized in order to protect privacy. The data analysis was conducted in three steps. First the empirical data was coded with theory driven codes denoting the resources in a service system and the value propositions (P, O, T, S.I. and V.P). Table 3 displays the coding scheme.

Theoretical concept	What concept captures	Code	Question asked while coding
People	Physical resources with legal rights	P	What are the characteristics of the people in the service system and how is their relationship?
Technology	Physical resource that is treated as property	T	What are the technologies that enable the services? What is the role of RMS?
Organization	Conceptual resources with legal rights	O	What are the organizational processes within the service system?
Shared Information	Conceptual resources treated as property	S.I	What is the shared information in forms of language, laws and measures?
Value proposition	Valued proposed from a provider to the client	V.P	What are the value propositions?

Table 3. The coding logic

With the empirical data coded with these five theory driven codes, we went back to the material and identified subcategories to these five initial codes.

They are presented in the following section, and some specific quotations from the interviews are used to highlight certain discussions. The third and final step in the analysis sought to answer the question of how these five elements of a service system are affected by the introduction of RMS.

5. Results

5.1 Organization

The region managers have monthly meetings at the different service workshops with all staff members. In these meetings subjects such as financial aspects are reported, evaluated and discussed. There is no determined process for evaluating the service delivery, other than from a financial perspective.

The customer relations' leader for every site is responsible for the work planning, which is done on a weekly basis. Even if there is an intention to plan the maintenance work, the schedule constantly changes, due to ad hoc activities. Currently, when a customer requires maintenance, preventive or corrective, he calls either the customer relations' leader or the mechanical or technical staff with whom he already has an established contact, expecting immediate help:

They almost insist on getting help rather quickly and they do not want to be left standing for too long, they want to hear that they are getting help. [...] If I see that I have a service check tomorrow, then I skip the service check and drive to this work that is urgent, because a machine that stands still always comes before the service checks. (P9)

Some customers have installed the RMS Track, which enables the technicians to deliver some maintenance service from a distance. Some technicians, use it occasionally to troubleshoot before the maintenance. Other maintenance services that it is used for is adjustment of settings and software updates. Track was released by Lumberjack two years ago and was an R&D driven project. However, the development of the RMS had no direct connection to maintenance and service, and the Lumberjack did not alter their organizational processes when launching the new service:

The maintenance was the same before and after; its own operation. Track is really not used for preventive maintenance that much. It is used mostly for solving urgent problems, but also for file transmission. The maintenance processes were not re-organized. (P7)

The initiative for their forthcoming launch Fleet was also an R&D driven project but the sales- and after-sales departments have been, to some extent, part of the project, as there has been a fear of the same failure in this RMS launch:

It is the same problem as with Track, they have never thought about how the maintenance processes need to be re-organized; how the relationship with the customers needs to change, how the customers' processes actually need to change. There was a risk that it could have gone the same way with this, but now it feels as if we are on the right way. (P7)

5.2 People

As service providers, Lumberjack's goal is to make sure that all clients machines are up and running. If there is an inspection planned for the day, and a breakdown occurs, the inspection is postponed and instead the breakdown is prioritized.

The service is performed in close contact with Lumberjack's clients. The service protocols are arranged so that the client is responsible for performing some maintenance himself. The providers have in fact such a close contact with their clients, that sometimes it almost causes problems:

We have a pretty close relationship with our customers (...) As for the mechanics; it's both for the good and the bad. Sometimes I think it becomes a loyalty problem, that you are so close to the customer that they feel sorry for him if something breaks, maybe I should give you one hour for free. (...) On the other hand, it is a huge opportunity to have that kind of customer relationship, that we actually know all of our customers (...) that is really what we sell upon, a good relationship. (P3)

If the client has Track installed, Lumberjack uses the RMS to perform troubleshoots and software upgrades. This have proved to be of great value for some clients, when machines have been quickly brought back to working order, and it is also valuable for the providers:

It serves its purpose, just to avoid travelling for small stuff. (...) It is a lot value if I was at one customer and did a software update, and not that long after I learned that we have a computer bug in it, and then it is a piece of the program that should be entered in the machine.

Then I just transfer it and start it up, instead of driving to the customer. It is of high value. (P6)

When the providers meet their clients they express the importance of the relationship, openness, promptness in the service delivery and trust:

The forest is so small, so to get the trust from them, so that they feel that if they have a small problem, they can call me, and they know that I will in any case try to fix it for them and help them. And just that, that we know each other, or know how you are, is quite important I think. (P2)

5.3 Technology

The RMS Track was launched as a support service for the customers. The technology is based on mobile communication, which enables the operator to quickly get help directly via the computer, from the technician in the service center. The system consists of software installed in the machines' PC and a mobile network. The technician can support with troubleshooting in software and hardware, help with machine settings and also software updates. The maintenance staff find the system helpful:

Track is really good in that we can ourselves go in and check, if case its nothing wrong with the computer or the connection. We can go in and troubleshoot and show the driver how you do some settings, because there is an infinitive numbers of settings. The drivers have a hard time keeping up with how to adjust them. (P6)

The technology is mostly installed in new machines, but not so many customers have bought the system when they have invested in a new machine and the providers think it depends to some extent on the cost for the installation:

It is expensive to buy it when you invest in the machine. (...) the cost weighs a great deal and then it is the marketing. We really need to talk about what this is for, and talk about the benefits with it. (P9)

Lumberjack is currently in the process of launching their new RMS Fleet, which will replace Track. The technical solution consists of 3G communications, where the modem that is connected to the machine's control system, sends information through a VPN tunnel to a server. The server is connected to a Web application, facilitating the access from any computer or mobile phone. The machine

owners can get real time data about their machines from their offices or mobile phones, consisting of GPS coordinates, operation status and production data. They can also get alarms through email or on a website and have access to all information and history from the time when the machine was connected to the Fleet system. Furthermore one may to log key performance indicators, where the calculations are based on three-month rolling data. The system provides equipment for analyzing and comparing the detailed information between different machines, models, harvester heads etc. The new RMS also opens up the data for the machine owner who now can access the same information as the technicians at Lumberjack:

5.4 Shared information

Shared information in a service system is the use of a common language, laws and measures. Through close contact with their clients, both while performing maintenance in the forest and when providing support over the phone, Lumberjack has established a common language. There are formal contracts in the form of service agreements governing the relationship, but there are also informal contracts established through personal relationships and based on trust:

(...) There is something more than the competence, it is much dependent the relationship, that you work together. Because you do a lot of work together, the customer helps all the time, so it is also about how you cooperate (...) it can involve lifting and that can be a little dangerous, you lift a lot of items. Then it is largely about trust, not how fast you are, but instead that you feel safe that the person secures items properly. (P3)

Lumberjack's current RMS enables the transferal of information from a distance, enabling the technicians to access the machines' information from their offices. The technician can see the interface of the control system and the driver can see exactly what the technicians do, which enables the use of the information for an educative purpose:

I enter the machine and the driver sees exactly the same that I see, he sees everything that I do. At the same time, you sit in the telephone and talk to the customer, I am doing this and this happens. It becomes an education. As you have performed it sufficient number of times, hopefully they can manage this by themselves. (P6)

With the launch of Fleet, Lumberjack will use the RMS to create, store and share information both

internally and with their clients. This makes it possible to analyze the machines in their real setting and move towards a condition-based maintenance approach. The technology will enable a new dimension of information sharing, with access to much more detailed information than today, and also in real-time. Fleet will enable the clients to obtain more knowledge intense information about their machines. It will also enable the drivers to communicate with each other through remotely accessing each other's machines and thereby includes the potential to help one another.

Within Lumberjack, service is usually measured in terms of financial gains and customer satisfaction. For example, the clients often call and ask for advice as they commonly try to fix the machine's problems by themselves. This support is nothing that Lumberjack charges anything for; instead it is seen as customer care. For the clients, the service delivered from Lumberjack is measured through knowledge, time and price. The most important thing for the clients is to have as much-up time as possible on the machines.

5.5 Value proposition

From a provider perspective, the value propositions toward Lumberjack's clients are different kinds of service offerings. The firm's service concept includes service agreements, service without an agreement, RMS support and emergency repairs.

When the maintenance staff performs service checks, with or without an agreement, they are performing preventive maintenance with the intention to create value by preventing equipment failure. When the Lumberjack technicians are out on repair jobs, they are performing corrective maintenance, which creates value as machines recover from a breakdown. Remote support services enable fast help through remote access of the control system. Lumberjack's current RMS service Track had no clear value proposition when it was launched but in effect Lumberjack maintenance staff are able to aid their client faster from a distance than if they would have to be on location with the client. The RMS is thus regarded as saving both time and money for Lumberjack and their clients.

With their future launch of the RMS Fleet, Lumberjack's expectation is to co-create value with their clients by providing a tool for access of more knowledge-intensive data and thereby analytic tools for the machine owners. Furthermore the system will provide an opportunity for the machine owners to remotely support their drivers, and also enable support between the drivers using the remote support technique. This is expected to lead to decreased maintenance costs and a reduction of downtime for the clients.

For Lumberjack, their goal with the launch with their forthcoming RMS is to integrate the customer more into the maintenance process and to be able to offer a more proactive approach to maintenance, but also to sell educations, based on the knowledge from Fleet. For internal benefits, the expectations are that the RMS solution will create value by acting as a platform for prospective value adding services. The operational data will also provide the opportunity to develop a more preventive and condition-based maintenance process through the creation of an extended knowledge base. As the continual data analysis increases general machine knowledge, potential product problems can be identified early on and avoided in further manufacturing, thereby leading to design improvement.

6. Discussion

Previous calls for being detailed about IT imply that a certain technology has particular features that need to be articulated and studied in order to fully comprehend their influence [16, 18]. This study has focused on a manufacturing firm trying to create value-adding services, through combining specialist knowledge with new IT. Because IT is increasingly becoming integrated into new forms of services, there is a need to understand the implications of technology in a service system. The aim of this paper was to explore the transition from a G-D to a S-D logic using RMS as the instrument of transition. In following Lumberjack and their use of an RMS to create services, we have also been able to study the process of value co-creation. By adopting a service system perspective and tracing its main resources involved in value creation; people, technology, organization, and shared information, we have examined the value propositions that are brought forth, and the roles the different resources play. In this section we discuss our results in relation to existing literature.

6.1 Organization and people

RMSs provide information resources through their ability to deliver constant machine surveillance, advanced data analysis, and hence early error finding and notices. For the provider's organization, this implies an implementation of a more organized, better scheduled and more effective maintenance organization, through the planned maintenance and need-based repairs, that RMS enables. Earlier research has displayed the opportunities for organizational transformation with the introduction of RMS, both in their early phases of implementation and over time [37]. From an organizational point of view, the

introduction of RMS affects the organization, in that the technicians can perform some service from a distance, cutting down time spent on travelling to customer sites. An RMS also enables technicians to know in advance which problems they are setting out to solve, saving both time and money as accurate spare parts can be brought from the start. A higher quality service, with less “fire-fighting” activities and more schedule maintenance, also leads to a decrease in down-time for the customer, creating value for them. However, this study also shows that in order for the technology to genuinely affect organizational processes, the management needs a strategy for technology introduction and use. An RMS in itself does not automatically bring a more effective maintenance organization and consequently more value for the provider; while a lot of potential is embedded in the technology, it needs to be seen and managed as a strategic instrument. In the transition from a G-D to S-D logic, it thus becomes central that the relationship between organization and technology is made explicit, so that the value creation may be stimulated instead of hampered.

Research has shown that when introducing new technology into a service system it is significant that the supplier comprehends the perspectives of the client or else there is a risk that the service experience will be depersonalized by the use of technology and cause frustration for the customer [35]. With the use of RMS the number of physical visits to the clients’ machines may dramatically decrease. For a firm such as Lumberjack that bases its service organization to a large extent on their relationship with their clients and the clients’ trust, it is important that this issue is addressed. This study has shown that an introduction of RMSs requires a strategy for how to build and sustain relationships and trust between the provider and the receiver. For service providers it thus becomes a key strategic challenge to address the change in relationship between the provider and the receiver that the RMS brings and see how the near relationship and trust can be maintained without face-to-face communication.

6.2 Technology and shared information

Shared information (language, laws and measures) is an important resource in a service system as it enables communication and is a prerequisite for co-creation of value [27, 15]. With the introduction of RMS, information can be shared through the technology and can be collected from a distance. Furthermore, the information is shared from both the provider and the receiver, enabling co-creation of

value. The information shared from the client to the provider is in fact fundamental for the provider to perform the required service. We have seen that with the introduction of an RMS, the technology, because of its specific characteristics becomes deeply intertwined with the shared information resource. The RMS collects data and creates the information that is shared, and also serves as a common interface for data interpretation. The characteristics of RMSs thus enable new ways of information sharing within a service system and across organizational boundaries.

When considering shared information in terms of language, we have also seen that this is affected by the introduction of an RMS as the data collected requires new ways of standard encoding. Moreover the laws associated with shared information are also altered with the introduction of RMS. The new technology requires new set of rules, in that the information from the receiver is allowed to be transmitted to the provider, and thereby pass the organizations limits, which was previously the boundaries for the knowledge-intensive machine information.

As the characteristics of the new technology, RMS enables new ways of information sharing, and thereby becomes how the information between the provider and receiver is shared, one can say that with the use of RMS the resources of technology and shared information within a service system, are being intertwined. The technology also creates, stores, transmits, and upholds the shared information. Through the intertwining of technology and shared information resources in the service system, the other resources in the system are also affected. The relationship between the provider and the client is affected, in that the provider is dependent on the client’s information in order to be able to deliver the service. Clients are therefore becoming resources instead of targets, which is characteristic in a shift from G-D to S-D logic [33]. Furthermore, since organizational activities are centered on the information provided by the RMS, maintenance decisions are dependent on correct data analysis. This implies a shift in the conceptualization of trust, from being created and upheld between individuals in organizations to being a part of the technological resource based on the shared information it creates.

6.3 Value co-creation

In a service system, value is constantly co-created and must be established in use, from the customer’s point of view [34]. Service systems participate in knowledge-based interactions to co-create value, which means that developments in service innovation are only possible when a service system has information about

the abilities and the needs of its customers, its competitors and itself [15]. Service system resources have different sets of competencies that are distributed among them and connected by the value propositions [15]. The introduction of an RMS into a service system changes not only the technological competencies, but also the required competences of other resources in the service system. We have seen that an RMS pushes the provider to transfer to a logic of value as co-created. The value of the remote monitoring service is created with the input from the receiver, in forms of the information transferred. Transferring the position of value creation from exchange to use, or context, means changing our understanding of value from one centered on units of firm output, to one centered on processes that integrate resources [34].

According to S-D logic, a firm cannot produce value on its own, it can only produce value propositions and it is up to the clients to define whether value is created or not. [34]. Previous research has shown that providers have to be able to specify what the intended particular added value of a certain service is and how value is created, in order to succeed in building relationships [12]. When studying Lumberjack, we have seen that their value proposition regarding their RMS Track was not made explicit. The clients did not what they would gain by using the system and the service was not used to a great extent. This study shows that in order to actually create value, the provider has to be clear about their proposition that they present to their customers. Even though the term co-creation would indicate input from both provider and client, it is a very imbalanced relationship where the provider bears full responsibility for handling the value creation process and coming up with an acceptable value proposition.

7. Conclusions and suggestions for future research

This study has examined the case of Lumberjack in their process of creating new value adding services by using RMS. By placing a specific focus on the resources of a service system, we have shown how the introduction of a new technology has a potentially strong impact on the other three resources in the service system; organization, people, and shared information

An RMS has the potential to change organizational processes and boundaries. It also changes the relationship between the service provider and the client, through the increased reliance upon and trust in technology. As data collection and analysis become the basis for co-creation of value, the service

system must adjust accordingly, creating strategies for resource allocation.

Furthermore we have shown that RMSs evoke a conceptual intertwining of the technology and shared information. The technology enables and presupposes new ways of information sharing, thereby becoming how the information between the provider and receiver is communicated, decided, and measured. Technology thus becomes both a physical and conceptual resource in the service system.

This study also points to the importance of presenting clear value propositions in order for service delivery and co-creation of value to take place. A shift to S-D logic implies a shift to a more client-centric relationship, and while it is the service provider who bears the responsibility for coming up with value propositions, it is the client who decides whether value is created or not.

This study was performed from the service deliverer's point of view as we followed a manufacturing firm's process of transitioning from a goods-dominant to a service-dominant business strategy. Future research should of course also take into account the customer point of view, to delve deeper into the concept of value co-creation.

8. References

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