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RFID-based Business Models

A Case Study from the Textile Industry

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1 Introduction

Radio Frequency Identification (RFID) is still one of the most recognized innovations in the field of information systems and supply chain management. The adoption rate of RFID however, is still relatively low, but early adopters of RFID from leading industries are driving the use of this technology forward. In reference to the numbers of implemented and planned big scale projects, the textile-industry is one of these leading industries in RFID-implementation (Straube et al., 2008a). Leading companies like Lemmi Fashion (Speer, 2006), Gardeur (Berger, 2006), Kaufhof (Wessel, 2007) and Gerry Weber (Loebbecke et al., 2006) (Loebbecke, 2004) (O'Connor, 2007) are already trying to benefit from supply chain-wide transparency by deploying RFID-tags on the item-level and attaching of the tags at the suppliers in the origin countries. Additional benefits can be realized through the combination of RFID and the electronic article surveillance (EAS) (O'Connor, 2007). With a combination of these technologies, cycles of reusable regional EAS need to be expanded to international EAS. The tag-cycle can be organized in-house or outsourced to a service provider. The business model is an Analytics and Design-framework, which can be used to identify challenges of such a reconfiguration, from local to international, as quickly as during the conception phase.

The organization of a tag cycle is only one of the activities necessary to support a successful RFID-application. Other examples are the tagging, systems operation or maintenance. These activities, which need to be executed during the complete lifecycle of a RFID-system can generally be executed by the user of the system itself or outsourced to a service provider. Most companies will outsource some of these activities due to competency gaps and economical reasons. This opens up large profit opportunities for service providers, which will need to develop competitive business models to position themselves on the market.

The following article will point out how potential RFID-services can be identified through a generic RFID-activity-lifecycle and be transferred into business models for service providers. To track and gain new insights on the development of RFID, a study in the textile industry has been conducted and is included in this article.

Scientific publications dealing with services in the field of RFID often focus on services that are enabled or supported by the technology use, like information- or tracking services (Fleisch et al., 2005) (Krasnova et al., 2007) (Bovenschulte et al., 2007) (van Lieshout et al., 2007). RFID-services, in the sense of supporting services, are considered in just a few scientific publications such as Fleisch et. al. (2004). The authors expect growing profit opportunities for logistic-service-providers due to the tense competition in the market of RFID-services. A possible service they mention is the tagging of objects (Fleisch et al., 2005). Angeles (2005) describes the service offerings of different software and hardware-providers as well as system integrators, like IBM, SAP or Sun. These include the integration, installation and maintenance of the hardware and software, as well as different consulting activities (Angeles, 2005). Bhuptani and Moradpour (2007) add to the list the offering of training, certification, market analysis, operating the infrastructure as well as the organization of slap and ship-delivery (Bhuptani and Moradpour, 2007). And lastly, Straube et al. (2008) describe different participating actors in the context of partner integration and their service offerings (Straube et al., 2008b).

From what is known by the authors, none of the publications above provide a complete and holistic picture of the RFID-service landscape, nor is the development of these services considered.

2 Systematic of RFID-Services

The purpose of the following article is to close the gap existing in scientific literature concerning the classification, description and design of RFID-service. Therefore, the basic characteristics of the "Make-or-Buy" decision or the "Do-or Buy" decision (as we are talking about services) will be described. Furthermore the next sections will introduce a classification scheme for RFID-services and a generic RFID-activity-lifecycle, which in combination can help to identify possible service offerings.

2.1 Do-or-Buy-decision

While implementing a new business process the company must decide if it should do it on its own, outsource some minor sub-processes or outsource the whole process (Pardos et al., 2007). During the process of a Do-or-Buy-Decision making, the company will consider the positive- and negative-alternatives. The criteria that must be considered include the comparison between the internal and external procurement price (Higgins, 1955), the relative ability for problem-solving, and the expansion and creation of competitive advantages through this process and the cost of opportunity (McIvor, 2008). A positive outsourcing decision will be made if the competitive advantage and the internal price are higher than the external ones, if the cost of opportunity seems manageable, as well as if the outsourcing company's abilities far exceed those of the suppliers (McIvor, 2008). The challenges of the Do-or-Buy-decision include retrieving the data needed for the decision-making and the evaluation of the concerning factors (Pardos et al., 2007).

2.2 Systematic of RFID-services

Services in the field of RFID are usually provided to companies and thereby belong to the intensive services. On the contrary, consumptive expenditures, for example a haircut, are offered directly to the consumers in the private sector (Bruhn, 2001). For a rough classification, services in the field of RFID can be divided in two groups: RFID-enabled or -supported services and supporting services.

RFID-enabled or -supported services are services, in which the technology is integrated in the service delivery process to increase the efficiency and effectiveness of the process. Higher efficiency can lower the costs of the delivery. Thereby the profitability of the operations or the attractiveness for the customer increase – through passing the savings in the form of lower fares – can be increased. Higher effectiveness relates to a higher service level. This can be achieved with the optimization of existing services or with the creation of new innovative services, which generate additional benefits for the customer (Kamoun, 2008).

Supporting services are services, which are performed by internal or external service providers during the implementation, expansion or shut down (Illustration 1). In principle every activity performed during the RFID-lifecycle is a possible supporting service. In the following these services will be called RFID-services.

Beside the classification by the scope the service can be classified according to its level of innovation. On the one hand there are efficiency- and effectiveness-centered changes of existing services; on the other hand there are novelty-centered developments of new service products (Zott and Amit, 2006).

<table>
<tr><td rowspan="3">RFID-supported or enabled service</td><td>unchanged scope of service (higher efficieny)</td><td rowspan="2">existing service product</td></tr>
<tr><td>extended scope of service (additional benefits for the customer)</td></tr>
<tr><td>new service products enabled through technology</td><td rowspan="3">new innovative service product</td></tr>
<tr><td rowspan="2">RFID-support service</td><td>new service products for implementing, updating or disposala RFID-system</td></tr>
<tr><td>new service products for the operation of a RFID-system</td></tr>
</table>

Illustration 1 Typology of RFID-services

2.3 RFID-enabled and supported services

The use of the RFID-technology could lead to improvement in the efficiency and quality of many services. Through the automation of scan processes, manual steps could be replaced. Furthermore, additional read points could be realized, which would enrich the data base and open many opportunities for value creating data analytics. The group of the RFID supported services contains all services in which traditional data capturing is substituted or enhanced via RFID. Examples of RFID supported services are inbound and outbound logistics processes or enhanced tracking and tracing. RFID enabled services in contrary become feasible through the usage of RFID. An example of such a new RFID service feature is the billing for the usage of an asset, based on tracking data stored on the RFID transponder.

The potential for the integration of RFID in logistics and production processes is huge. Moreover, there are few ideas for RFID enabled services that have already been implemented. Therefore there is a need to adopt or develop a design and analytics framework, which can be used to assess the implications of RFID implementation on existing processes and help design new processes.

2.4 Tag-cycles as part of the RFID-process landscape

Besides RFID enabled and supported services, many possible services lie in the activities of the RFID lifecycle. A lifecycle describes how a natural or manmade system evolves from its initial conception until its final disposal. From a systems engineering perspective, several generic phases that make up a systems life cycle may be distinguished. These include a design phase, a utilization or operation phase, followed by either a redesign or disposal phase (Haberfellner et al., 2002). If RFID is implemented, new decision-making and material flow processes need to be designed as well as the enabling RFID system (Saygin et al., 2007). Such RFID systems consist of three layers: the device, integration, and application layers (Gross, 2006). Once the system is implemented tagged logistical objects can be automatically identified while flowing through the supply chain. The capturing data is processed by the RFID-system and made available in order to improve decision making. That way the technology helps both to automate data capturing processes and to increase supply chain visibility.

Specific RFID related services can be assigned to each phase of RFID-enabled processes or to a RFID system. During the first and final phases, potential services support the implementation, upgrade, or disposal of an RFID-based solution. During the operational phase, services include the operation of the RFID system itself, the analysis of data generated by RFID or – the topic of this paper – the management and operation of the tag cycle. (Illustration 2)

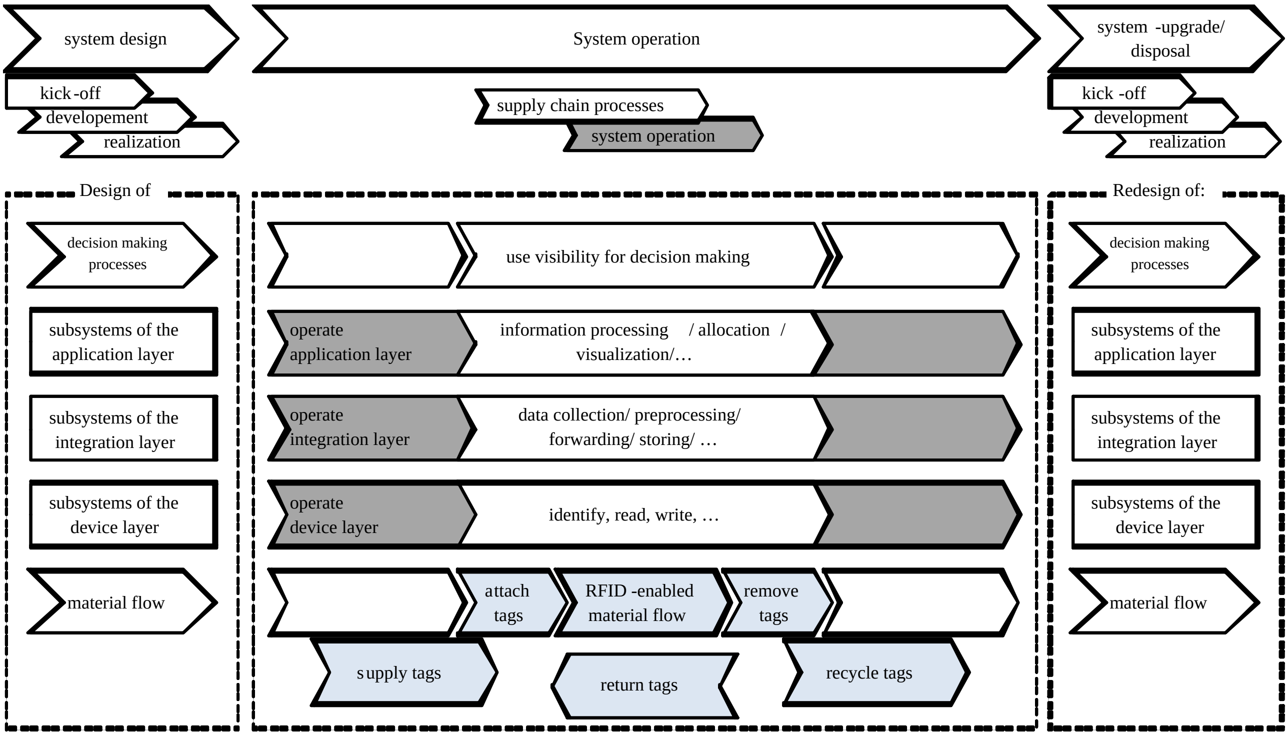

Illustration 2 RFID-process landscape

To profit from RFID, the objects inside the flow of materials have to be tagged with the RFID tags. Tags themselves go through a lifecycle, that begins with the production and ends with the final disposal (van Lieshout et al., 2007). While van Lieshout et al. 2007 describe a generic tag life cycle from a tag's fabrication until its final disposal, the authors describe the tag life cycle from the perspective of a technology user – here a fashion company – based on the concept from van Lieshout et al. 2007 complemented by findings of the authors from various RFID-projects (van Lieshout et al., 2007). In most cases, the tags are not manufactured by the deploying companies. Thus the supply of tags, the tagging of logistic objects, the productive use of the tags for identification purposes or the RFID enabled material flow followed by, if applicable the removal of the tags, the return of reusable tags or the recycling of one way tags, are the key processes of the tag cycle from the point of view of RFID-users. Additionally, the coordination of this tag cycle is of high importance.

The design of the tag-cycle depends mainly on whether a tag is used once or more often in a cycle. It is also important whether the tag is affixed permanently to the logistic object or if it can be removed from the object after it has fulfilled its purpose. If one-way-tags are used, the detachment and return processes will not be implemented. Instead, the tags stay on the object or are recycled. If the tag is permanently affixed to a reusable object, for example a container, the tag will be returned together with the object and the removal and recycling will be omitted. To guarantee a lifetime of a several years, multiple-use-tags are more robustly constructed, for example covered with or embedded in durable plastic a high density plastic. A multiple-use-tag with a minimum lifetime of four years can be used in average of eight times, though they are less expensive per usage in comparison to today's standard one-way-tags.

The organization of a cycle for reusable tags is a quite complex task. In the following paragraphs, the processes of the tag-cycle – supply, attachment, removal, recycling and return – will be described in detail. The supply of the tag includes the procurement of the amount of tags needed for the actual tagging, or the process or replacement of damaged tags. Moreover, the quality of the tags is controlled. As a prerequisite for the attachment of the tags, the amount needed must be buffered either at the point of attachment or at the different points of the supply chain for the replacement of damaged tags.

The attachment of the tags or tagging process includes both the physical and the data wise connection of tag and object. There are several connection types for the physical attachment depending on the RFID application. In textile, for example, the most common tags are hangtags, which are attached via plastic thread. For the data wise connection it is necessary to perform a teach-in-process, which is the writing of data on the tags; e. g. a unique identification number or user data.

The counterpart to the tagging process is the de-tagging process where the tags are removed from the object and the data wise connection is reversed. In the case of one-way-tags or tag damage, the tags will be removed from the object after or during the usage. Tags that are removed are disposed of and cannot be reused again. The disposal includes the consolidation of the tags and the disposal itself. In some cases it can be useful to keep the damaged tags and send them back to the manufacturer where they can be checked for failure analysis and continuous improvement.

If tags are to be used again independent from the object, they must be returned. The return process includes the collection, consolidation and redistribution of the tags. The tags will be detached and collected at different subsidiaries to be consolidated, for example at the point of sales in textile. They will then be redistributed to the locations where they will be re-attached. Since the tags could have been damaged during their usage, a quality control can also be part of the process. Normally, the quality control will be performed after consolidation or before re-attachment. By performing a quality control, the defect tags and the tags that have outlived their durability will be sorted out.

In addition to the process steps described, the coordination is part of the tag cycle as well. Especially in closed cycles, the inventory management of the tags can be an additional requirement. The processes, however, do not have to be executed strictly sequential. It can become necessary to perform some process steps, like the replacement of the tag, during the operations. Moreover, single processes, such as the recycling process, can be left out depending of the characteristics of the RFID application.

3 Case study: Organization of a tag cycle for Gerry Weber

The theoretical findings from the previous sections will be applied in the following sections to a case study of Gerry Weber, a fashion provider. Fashion is one of the leading industries in regards to RFID deployment. Thus fashion companies are among the first to implement RFID on item level and make use of the technology across company boundaries. The success of the technology within the fashion industry is based on two factors. First, garments are well suited for item tagging as textile fabrics usually do not disturb the radio waves RFID relies on and second, the importance of supply chain management is a competitive factor (Straube et al., 2005) (Straube et al., 2008a). Due to the competition and short fashion-cycles, the quick, punctual and cost-saving supply of retail stores gains more and more importance. Most companies focus on the design of the supply chain structure and processes, as well as the control of the flow processes, while the operative of the supply chain processes and the operation of IT-infrastructure are primarily outsourced (Straube and Pfohl, 2008).

Potentials of RFID for the fashion and textile supply chain include more efficient supply chain processes (Gaukler and Seiffert, 2007) (Loebbecke, 2004), higher transparency over the supply chain from the manufactures to the retail stores (Chappell et al., 2003b) (Tellkamp and Quiede, 2005), as well as new options for advertising inside the stores (Chappell et al., 2003a) (Thiesse and Fleisch, 2007). To profit from these potentials, fashion companies need to tag individual items, preferably at the manufactures' site. This process is often referred to as Source Tagging. Tagging the garments at consecutive stages of the supply chain is possible but usually more expensive due to increasing labour costs and the fact that the garments need to be unpacked for tagging. Companies that rely on source tagging must cope with the low quality of the technological infrastructure at many production sites and the fact that supplier-buyer relations are quite volatile in the fashion branch. Therefore, a simple and flexible RFID solution is necessary to well-equip the suppliers. Since logistic operations are generally outsourced, fashion companies need to cooperate with logistic service providers once they plan to implement RFID. Logistics service providers could profit from this trend and expand their business by adding RFID-related services.

3.1 Data collection and case-scenario-structure

To gain new insights, an explorative case study has been conducted. The case study gives an in-depth description of a service-model in the textile industry. Since the textile industry is one of the leading industries concerning RFID, the results of the case study give interesting insights which can be generally applied to other industries as well.

During the data collection there were several interviews conducted with the employees of Gerry Weber. Under the interviewees were the chief of Logistics & retail IT as well as the project manager of RFID. In addition to this, the authors of the article had insight into the documents for the contract out process and the offers of the service providers.

3.2 Company description

The Gerry Weber International AG is a worldwide operating fashion and lifestyle company with more than 2,160 employees, 240 subsidiaries, and an estimated turnover of 575 million euros for the business year 2007/2008. Gerry Weber belongs to the RFID pioneers in the German textile industry. In the year 2003, Gerry Weber conducted a RFID pilot project, which assessed the feasibility and the potentials of the RFID deployment on the item level in the textile supply-chain, together with the department store Kaufhof and the logistic-provider Meyer & Meyer (Tellkamp and Quiede, 2005). Since 2003, Gerry Weber has also been using RFID in the management of returnable containers. In the year 2007, Gerry Weber decided to roll out RFID throughout the whole supply chain in 2009. In the roll out, all subsidiaries, logistics service providers, and suppliers will be integrated. Due to economical reasons, a reusable RFID-EAS-transponder will be used. Within the roll out, a number of RFID services will be contracted out.

The case study focuses on the organization of the tag cycle, which has already been contracted out. The authors supported the process and have therefore an in-depth understanding of the request of proposal and the proposals of the service providers.

3.3 Case description

Gerry Weber expects the RFID implementation to increase the process efficiency through the automation of scan-processes and the improvement of operating and intervention abilities through an increased visibility. Furthermore, the RFID-tag will be integrated with the EAS and the attachment process will be relocated to the source countries of the products. Thereby, Gerry Weber will profit from lower costs of labour. Although this benefit cannot be associated directly to the RFID technology, it is inseparably connected and crucial for the business case of the RFID project. In the future, Gerry Weber plans to integrate the tags into textiles, and to use a separate EAS. This solution will only be realized if the acceptance of the customers is guaranteed. An integration of both technologies into one paper-tag, like it had been done by other textile companies, was refused by Gerry Weber, due to inadequate theft protection.

Within the RFID project all RFID processes, including the organization of the tag cycle, are outsourced to supply chain partners and solution partners. Exceptions are the processes close to the consumer, like taking stock at the point of sale.

The most important selection criteria are the service quality and the price. In regards to the tag cycle, the outsourcing will be less expensive than an equivalent in-house solution. Moreover the service provider has to develop specific competencies which Gerry Weber currently does not have and does not plan to develop.

In the following paragraphs we will take a closer look on the proposal of the service provider chosen for the organization of the tag cycle, a provider who has specialized in textile issues. The service provider will be responsible for the coordination of all sub-processes described in paragraph 3.4, including the distribution of the tags to the suppliers in Turkey and China, the buffering of the tags at different locations in the supply chain, the consolidation, the quality control and the redistribution. Aside from the organization of the tag cycle, the service provider will clear customs for the tags. In the operative fulfilment of these tasks, different logistics service providers, which are at the moment already integrated in the delivery process for garments, will be integrated.

Since the tag cycle is a completely new service, which no provider has offered before, the provider must transfer this task description into a service product. For the transfer, the provider has to consider different aspects. In the next section, we will show how the business model can be used to systematically assess the most important aspects for the delivery of a competitive and profitable service.

4 Business Models for RFID-Services

Since the tag cycle is a new service, a novelty-centered business model must be designed. The service provider has to transfer the identified processes to a product that is ready to be brought to the market. In other words, the service provider must design a business model for the service delivery.

4.1 Business model as analytics- and design-framework

The business model offers an analytics- and design-framework for the configuration of a product or a service (Kamoun, 2008). It describes, how separate elements of the business activities have to be designed to lead to competitive advantages and transfer them into profit (Afuah, 2004) (Magretta, 2002). The business activities must be divided into manageable subunits, which can be designed and evaluated separately in a first step, and as an entity afterwards. The deconstruction into partial models enables an integration of competing strategic management points of view, including the market-based view and the resource-based view (Amit and Zott, 2001) (Kraus, 2005).

As an extensive literature review, we suggest to use a construct of five partial models for a holistic description of the business activities: Value Proposition, Delivery Process, Configuration, Positioning on the Market, and Profit Capturing (Illustration 3) (Afuah, 2004) (Kraus, 2005) (Timmers, 1998) (Wirtz, 2001). These five elements can be further divided in subcomponents, including actors, technology, profit or costs.

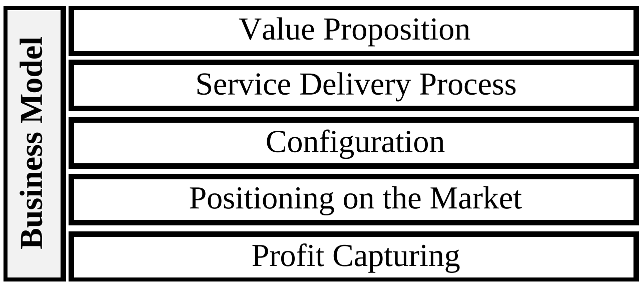

Illustration 3 Business model-framework

4.2 Value proposition of the tag cycle

The Value proposition describes which value will be delivered to the customer (Timmers, 1998) (Stähler, 2002). In the case of the tag cycle, the service delivered to Gerry Weber belongs to the category support service for the operation of the RFID application. Therefore, the value for the customer does not lie in the automational and informational benefits of the RFID technology (Straube et al., 2007) but in superior service quality of the tag cycle and lower costs for delivery. However, this service is a prerequisite for the RFID application and the benefits gained through automation and higher transparency. Therefore, the service provider has to design a delivery process, which offers sufficient quality at reasonable prices.

4.3 Service delivery process of the tag cycle

The description of the delivery process should include all sub-processes necessary. The RFID process landscape introduced above can help to identify these processes. In our case, these are the distribution of the tags to the suppliers in Turkey and China, the buffering of the tags at different locations in the supply chain, the consolidation, the quality control and the redistribution. Though suppliers in Turkey and China will be supplied with tags, the following descriptions will focus on the supply of the Chinese suppliers, since the tasks being performed are more complex.

The tags will be collected and consolidated in a distribution centre of Gerry Weber's main logistics service provider. There, the tags will be reviewed for visual damage and put into boxes consisting of 500 tags and 500 attachment-pins. The boxes are then shipped to China via sea transportation. To assure the flexibility demanded by Gerry Weber, the service provider will operate a small distribution centre in one of China´s free trade zones, most likely Hong Kong. The suppliers will be supplied from this location, whenever they have to fulfil an order for Gerry Weber.

The suppliers will then order the tags via an internet portal, which will be built and hosted by either the service provider, the label-supplier or by Gerry Weber. The suppliers will have the possibility to pick up the tags on their own or have them shipped by the service provider. The clearing of customs has to be done by the supplier but will be monitored closely by the service provider. Needed documents will be prepared by the service-provider.

4.4 Configuration of the tag cycle

The configuration describes the partners involved and the competencies they bring into the delivery process (Timmers, 1998) (Weill and Vitale, 2001). From the design of the delivery process, the competencies necessary can be deduced. These are in addition to the design of the tag cycle, the competencies necessary, which in this case include the coordination of sub-providers, preparation and monitoring of clearing customs and eventually the development and hosting of the internet platform For the selection of the sub-providers the service providers have to conduct a Do-or-Buy-decision on its own and procure the services needed. Therefore, they must have access to the market and be able to bargain for good terms. The sub-providers have to be integrated in an early stage. Besides the logistics service providers, the label producer, with whom the shipment of the tag has to be synchronized, the custom authorities and the suppliers have to be consulted.

4.5 Positioning on the market

To compete on the market a company has to know its competitors. Besides existing competitors, newcomers, customers, suppliers or sub-providers, and substitutes have to be considered (Porter, 1987) (Afuah, 2004). Since the organization of the tag cycle is an innovation, there are no competitors on the market right now. Possible newcomers are specialized service providers, logistics service providers, which are also sub-providers, and label producers. Some of the logistics service providers who have experience with custom issues are already positioned internationally and are integrated into the supply chain. The label producers offer the printing and distribution of paper labels. The customer is of no threat as Gerry Weber wants to outsource the process. Possible substitutes are hangtags with integrated EAS and RFID as well as combinations of traditional EAS with RFID or Barcode, which is not an option in this case.

The main selection criteria have been price and quality. None of the competitors mentioned have had as low of prices as the chosen service provider. In addition, the company offers sufficient IT-capabilities, a good access to the logistics service provider´s market and has a competitive concept for customs clearing.

4.6 Profit capturing

The profit potential of a business model is determined by the revenue potential and the expected costs (Afuah, 2004) (Kamoun, 2008). Due to the numerous followers in the textile industry, which are still waiting to implement RFID, there is a large profit potential of tag cycles. If Gerry Weber can establish an efficient practice together with its partners, many textile companies will copy the model and implement these kinds of tag cycles.

In the Gerry Weber case, the service provider will charge per tag supplied. The turnover expected is the result of the multiplication of the number of cycles per year and the price per unit. Costs incur for the development of the IT-platform as well as for the service charges of the sub-providers.

5 Conclusion

During the implementation, upgrade and disposal of RFID-applications different tasks have to be performed. Since most companies outsource a great share of these activities, there is profit potential for service providers. The article introduced a typology for RFID-enabled and -supported services as well as support services. Potentially all sub processes can be outsourced to service providers. The RFID-process landscape presented in this article can help the users to identify processes for outsourcing. The case study within the article described the organization of a tag cycle for reusable RFID-tags as potential service offering.

To develop such a service product the business model can be used as an analytics and design framework. With the consideration of the five partial models: Value Proposition, Delivery Process, Configuration, Positioning on the Market, and Profit Capturing, a holistic and systematic design approach has been shown. This approach can be used to transfer any process of the RFID-process landscape into a service product.

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