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Value Adding Services to Leverage Product Sales

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<p>This study was conducted in order to propose new services that would decrease the customers' barrier for acquiring the core product of the case company. The core product of the case company has been developed for brain research but lately the company has changed its focus towards targeting mainly clinical customers. Although the information provided by the core product undeniably improves the quality of patient care, the case company has not been able to increase its product sales significantly.</p> <p>The study was conducted as a qualitative case study and started by analysing the current state of the case company and its offering, the service offerings of rivaling companies, and the customers. The current state analysis indicated that the clinicians find the core product and the system around it too expensive and complicated to operate. Therefore the study proposes services that would help the clinical customers to overcome these main challenges.</p> <p>In order to propose services that could meet the requirements of the target customers, a thorough study of service offerings in medical devices and similar niche industries was conducted. Based on that study, a preliminary proposal was built which contains five services that were described by utilising a conceptual framework comprised of four service elements. The preliminary offering was then presented to four customer organisations. Based on the customer feedback, the preliminary proposal was modified into the final proposal that consists of seven services.</p> <p>The final proposal was then presented to the management of the case company. Based on their feedback, the case company is going to further investigate the possibilities for adding some of the proposed services to the existing offering of the case company, or to collaborate with a 3rd party service provider.</p>	
Key words	Product Services, Medical Devices, Epilepsy, Neurology

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1 Introduction

This Thesis reports on the study that was conducted in order to propose ideas for the new services that would decrease the customers' barrier for acquiring the core product of the case company.

Mathieu (2001) discusses the division of product services between the services supporting the supplier's product (SSP) and services supporting the client's action in relation with the supplier's product (SSC). In SSP, the main goal of the services is the proper functioning of the product, while SSC takes a step further by offering services supporting the mission of the customer's organisation. This division is illustrated in Table 1 below.

Table 1. Product services classification (Mathieu 2001).

Dimension	SSP	SSC
Direct recipient	Product	Person
Intensity of the relationship	Low	High
Customisation	Low	High
Predominant variables	Physical evidence - process	People

In Table 1, Mathieu (2001) compares SSP and SSC in four dimensions of service: the direct recipient of the service, the intensity of the relationship, the customisation of the service, and the critical elements of the service marketing mix. In SSP, the direct recipient of service is the product, whereas in SSC the recipient is a person in the customer's organisation. The intensity of the relationship is low in SSP and high in SSC. While SSP is mainly a standardised service, SSC requires more customisation to meet the needs of each customer. Finally, the predominant variables of SSP are often something tangible (e.g. a correctly functioning device) but for SSC it is people, both supplier's and customer's. Mathieu (2001) sees a promising opportunity for innovation in SSC. Although the current service offering of the case company is SSP oriented, this study mainly considers future services from the SSC perspective.

1.1 Case Company

The case company was founded in 1989, and since 2003, it has been a subsidiary of a multinational medical device corporation. For the whole history of the company, its offering has consisted of one core product, some peripheral products, and services supporting the product. The core product is a system which is used for imaging brain functionality. Currently, the company employs around 30 persons in their office in Finland, the global employees, including the subcontractors, being close to 70 persons (Data 1a and h). The annual revenue of the company is about 20 million € (Data 1a). The customers of the company are spread around the world, with 22 customers being located in North America, 24 in Europe and Middle East, 10 in Asia and Pacific, and 22 in Japan (Data 1k). Including also the systems sold by competitors, there are some 150 systems currently existing in the world.

Almost a decade ago the case company has changed its marketing focus from researchers onto clinicians. Although the systems of the company give undeniable advantages to patient healthcare in some clinical applications, year after year the company faces the fact that the clinical breakthrough did not happen. One possibility for making the systems more tempting for the clinical users is to expand the service offering to address some of the issues the customers are facing. Therefore the objective of the Thesis is to explore the possibilities of expanding service offering of the company. The more clinical the customers are, the less experience and knowledge they have regarding the technology and applications offered by the company. Therefore it is foreseeable that in the future, the learning curve the customers face after acquiring these systems will be even steeper than it is today. Therefore this study proposes services that would help especially this type of customers.

1.2 Business Problem, Objective, and Outcome

The case company is a traditional product-centric organisation, and its systems have been designed for research use. Although the case company has now decided to refocus its offering towards clinical customers, in its current form, the offered systems are too complicated and inefficient to effectively meet the needs of the clinical customers. To address these deficiencies, the company is already working on the system to make it more suitable for clinical use, but at the same time, the company wants to explore whether new services, that would meet the needs of clinical users, would lower the barriers for acquiring systems by clinical customers.

The objective of this Thesis is therefore to propose value adding services that would accelerate sales of the systems produced by the case company. In more detail, this Thesis focuses on answering the following question:

What kind of services could accelerate adoption of the case company's system by clinical customers?

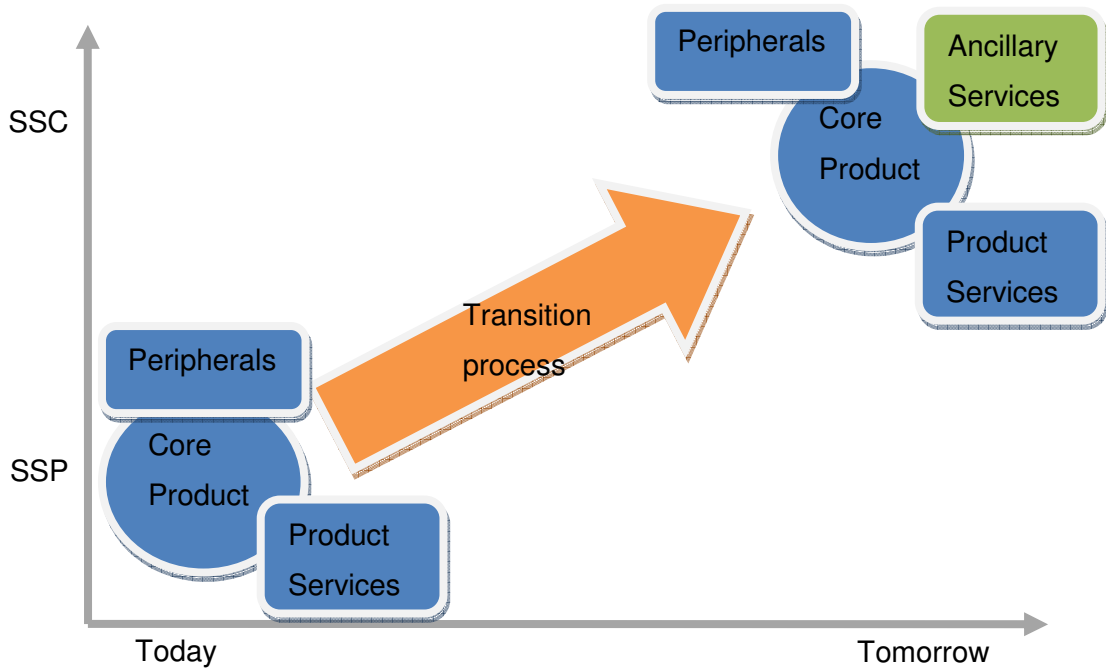


Figure 1. Transitioning offering of the case company.

Outcome of the Thesis is a proposal of value adding services (shown in green colour in Figure 1). In its current form, the company may not be able to offer some (if any) of the proposed service ideas. Fulfilling the missing gaps is part of the company's transition process (shown in orange in Figure 1) towards building its capability for offering SSC services. The transition process itself lies outside the direct scope of this Thesis.

1.3 Structure of the Thesis

The Thesis is written in seven sections. Section 1 summarised the starting points of the Thesis, while Section 2 describes the research methods utilised in the Thesis and data collection together with a plan to meet the validity and reliability requirements. The current state of the case company, the rivaling offering, and the customers are analysed in Section 3. Section 4 introduces the conceptual framework of the Thesis. Section 5 describes how the conceptual framework was used to create the preliminary proposal of the Thesis and how the proposal was tested with the customers of the case

company. Section 6 describes how the feedback of the customers affected the final proposal and how the final proposal was perceived by the management of the case company. In Section 7 the findings of the Thesis are discussed and concluded.

2 Method and Material

This section describes the research design, data collection, and validity and reliability plan of this Thesis.

2.1 Research Design of the Thesis

The study is conducted as a qualitative case study. The research design of the study is illustrated in Figure 2 below.

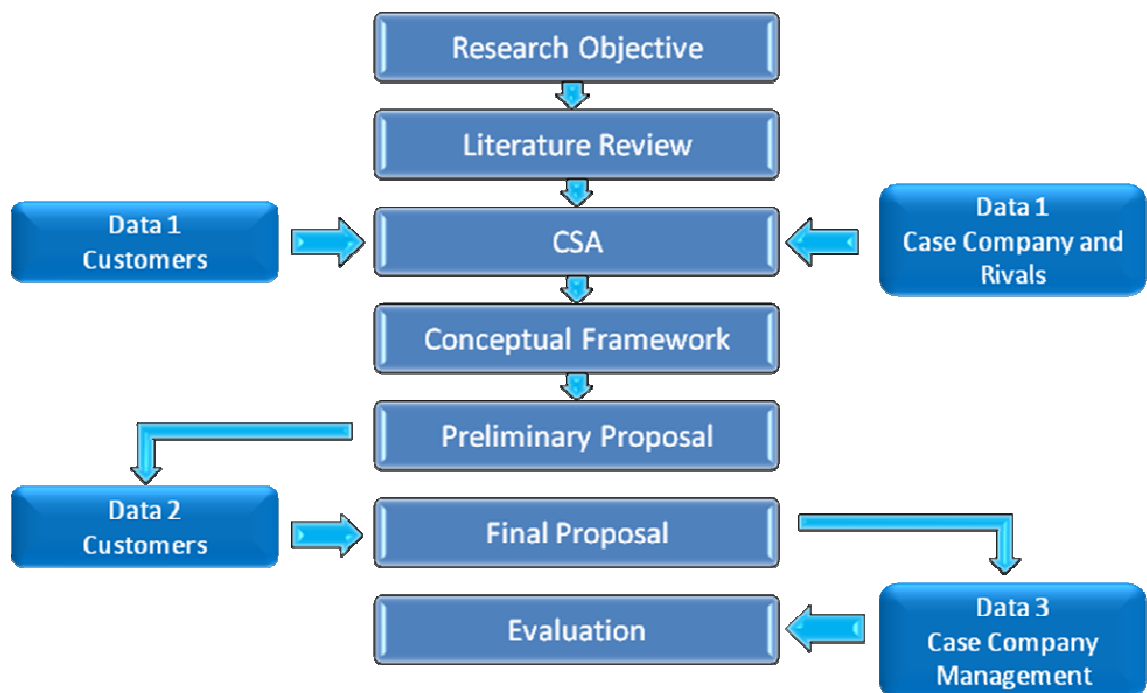


Figure 2. Research design of this study.

The research objective was set in collaboration with managers of the case company. The literature review consisted of the topics such as innovation, open innovation, service innovation, service development and design, combining products and services, business models, business logics, value co-creation, and different service types. But only the sources directly relevant to the final outcome of the Thesis are mentioned in the list of references.

After and partially along with the literature review, the current state analysis (CSA) was conducted. The CSA focuses on the service offering of the case company and its rivals, and the customer requirements. Phase 1 of data collection (Data 1) was conducted in order to build the understanding of the items analysed during the CSA.

Conceptual framework of the study was built to give the tools for meeting the customer requirements found during the CSA, and is based on the knowledge gathered through the literature review. The conceptual framework was then used as a tool for describing the service ideas proposed to the customers. This preliminary proposal was used as the basis of the brainstorming sessions (Data 2) held together with some key customers of the case company. The feedback of the brainstorming sessions (Data 2) was then used to modify the preliminary proposal into the final proposal of the study. The final proposal was evaluated by the management of the case company (Data 3).

2.2 Data Collection and Analysis Methods

As mentioned above, the study contains three phases of data collection. The first phase (Data 1) contains data from various sources needed for the CSA, the second phase (Data 2) contains the customer feedback of the preliminary proposal, and the third phase (Data 3) contains the company management's feedback on the final proposal of the study. Table 2 below describes Phase 1 in more detail.

Table 2. Data collection, Phase 1 (Data 1).

ID	Type	Topic	Organisation	Position	Date	Length
A	Document	Product Strategy Plan 2013	Case Company	-	-	-
B	Document	Management review January 2014: Customer satisfaction	Case Company	-	-	-
C	Interview	Company Information	Case Company	Manager A	March 13 th 2014	60 min
D	Email	Pricing of the Services	Case Company	Manager B	March 31 st 2014	-
E	Document	Go for Services – Field Work Report	Case Company	-	-	-

F	Web site review	Benchmarking of rivalling offering	Rivalling organisations	-	-	-
G	Phone call	Which customers to Interview	Case Company	Manager A	April 17 th 2014	30 min
H	Email	Employing Effect	Case Company	Manager C	February 5 th 2014	-
I	Document	Customer Needs Categorisation Criteria	Case Company	-	-	-
J	Email	Case Workflow	Case Company	Clinical Application Scientist	May 2 nd 2014	-
K	Document	Installed Base, April 2014	Case Company	-	-	-
L	Web site review	User Communities and Societies	Customers	-	-	-

As seen from Table 1, Data 1 contains relevant information needed for understanding the current state of the case company, its rivals, and the customers. The data used to analyse the current state of the case company was gathered from company internal documents (Data 1a, e, i, and k), a semi-structured interview (Data 1c), email exchanges (Data 1d, h, and k), and a telephone discussion (Data 1g). The data used to analyse the customer satisfaction and needs comes from two internal documents (Data 1b and e) of the case company. The benchmarking of the rivalling offering was based on a review of the web sites of the rivalling organisations (Data 1f) as was the analysis of existing customer communities and societies (Data 1l). All data used in this phase is classified as confidential by the case company and will be removed from the appendices of the publicly available versions of this Thesis.

Data 2 consists of the notes of four brainstorming sessions held together with the customers. Table 3 below describes Phase 2 in more detail.

Table 3. Data collection, Phase 2 (Data 2).

ID	Type	Topic	Organisation	Position(s)	Date	Length
A	Brainstorming (on-site)	Preliminary Proposal	Customer A	Project Manager	April 22nd 2014	3,5 h
B	Brainstorming (online meeting + email)	Preliminary Proposal	Customer B	Lab Engineer	May 2nd 2014	2,5 h
C	Brainstorming (on-site)	Preliminary Proposal	Customer C	Current and former Technical Directors	May 6th 2014	3,0 h
D	Brainstorming (on-site)	Preliminary Proposal	Customer D	Associate Professor	May 7th 2014	2 h

As seen from Table 3, the goal of the sessions was to test the preliminary proposal of the study. The gathered feedback was used to modify the preliminary proposal into the final proposal of the study. Three of the sessions (Data 2a, c, and d) were held at the customer premises while one (Data 2b) was conducted online by utilising a video conferencing system. The time reserved for meeting with Customer B run out so the customer filled up the remaining fields independently and returned the interview notes afterwards by email. After each interview the interview notes were sent back to the interviewees for review.

As emphasised by multiple authors (e.g. Alam 2002, Carbonell et al. 2012, Nabisan 2002, Roberts et al. 2005, and Carbonell and Rodriguez-Escudero 2014), selecting the correct persons to interview is important for conducting a reliable qualitative research. In this study, the analysis of the customer satisfaction and their feedback for another study gave the impression as if the customers think that the case company and its staff does not have good understanding of the customers' processes and requirements. Therefore the study tried to be as customer-centric as possible and the preliminary

proposal was tested only by the customers of the case company and only the final proposal of the study was taken to the management of the case company.

The interviewed customer organisations were selected together with the company management (Data 1g). Customers A and B have recent experience in building a laboratory around systems of the case company. At the time of starting their projects neither of the customer organisations had any previous experience in the technology of the system, and both were pioneers in utilising the technology in the respective countries. Both of the customers were still able to recruit experienced personnel before the actual acquisition took place. Customer C has more than 15 years of experience in utilising the technology. Customer C also has recent experience in building a new laboratory, as they replaced their old system some three years ago with a new system acquired from the case company. The old system was from one of the deceased competitors of the case company. Since replacing the system, the customer has also moved its laboratory into a new building and during the project they utilised the moving service of the case company. Customer D is fairly experienced in the field as well, as they have acquired their system from the case company some seven years ago. Customer D has collaborated with the case company by providing training positions for the end users of new customers of the company. The labs of Customers B, C, and D are in hospital premises and even Customer A is part of a medical school, so all the customers have insight to the clinical usage of the system. Still at the time of starting their operation, only Customer D had the background similar to the target customer type of this study: a purely clinical customer without previous experience in the technology and without knowing the experts in the field.

Table 4. Data collection, Phase 3 (Data 3).

ID	Type	Topic	Organisation	Position	Date	Length
A	Group Interview	Final Proposal	Case Company	Managers A, B, D, and E	May 9th 2014	2 h

As seen from Table 4, Data 3 of the study contains only one meeting where four managers of the case company evaluated the final proposal of the study. The responsibility areas of the managers were product management, services, marketing, and quality and regulation.

Thus, the data collection in this study was performed in three phases, Phase 1 being for the current state analysis, Phase 2 for testing the preliminary proposal by the customers, and Phase 3 for evaluation of the final proposal by the management of the case company. The plan to ensure the validity and reliability of the study is discussed next.

2.3 Validity and Reliability Plan

Validity of a study means that the study is conducted correctly and credibly. It includes the accuracy and correctness of the data, understanding the perspective of the people studied, paying attention to alternative explanations, avoiding researcher bias, and understanding the influence of the researcher (Maxwell 1996). Another critical element is providing the answer to the research question (Quinton and Smallbone 2006: 127).

In order to secure the validity of this study, the data collection will be described in detail, all interview notes will be sent back to the interviewees for verification, and the outcome will be built open minded.

Reliability of a study means that the findings of the study would be the same even though the study was conducted at a different point of time, by another researcher, or by using another method. Reliability also includes the trustworthiness and authenticity of the study. Trustworthiness consists of credibility (achieved through data triangulation), transferability (richness of data), dependability (piloting, testing, and auditing), and conformability (avoiding researcher bias). Authenticity consists of fairness, educative authenticity, catalytic authenticity, and tactical authenticity. (Lincoln and Cuba 1994)

In this study, reliability will be achieved by using differing data sources and data collection tools and by collecting data at different points of time. This section described the research methods, data collection, and validity and reliability plan of the study. The next section describes the results of the current state analysis of the study.

3 Current State from Services Point of View

This section analyses the current state of the case company and its offering, the rivalling offering, and the customers. Although the focus of the study is on services, even the proposed SSC services would still be offered only for users of the technology of the systems offered by the case company. Therefore the section starts by describing the offered system.

3.1 Offered System of the Case Company

The core product of the case company requires a complex system of supporting technology for digital signal processing, ICT, user interface, computing, shielding against external interference etc. Therefore instead of core product, the study uses expression *system*.

The system of the company utilises a state of the art technology for measuring the magnetic fields caused by the electrical activity of the brain neurons. Compared to other non-invasive functional brain imaging technologies, it is superior in combined localisation ability and time resolution (Parkkonen 2009: 3). Therefore it has been proved as invaluable method in understanding the functionality of brain. The main use of the systems is in brain research but the system has been accepted also for clinical use in 1) localising starting points of epileptic seizures or interictal epileptiform activity and 2) pre-surgical mapping of functional areas of brain (Parkkonen 2009: 2). The former provides invaluable information when considering and planning a surgery for reducing or even ending the frequency of seizures. New ways to exploit the technology are introduced frequently but getting them approved for clinical use is a lengthy process. The price of the systems is in the level of three million Euros, which means the system is among the most expensive systems of a normal clinical customer (Data 1c).

As mentioned above, the systems supplied by the case company can be used in various kinds of applications in brain research and clinical decision making. As the current focus of the company is on increasing the clinical usage of the systems, next usage example describes the workflow utilising a system of the case company in an epilepsy case.

3.1.1 Usage of the System in Epilepsy Application

In worst case an epilepsy patient can have epileptic seizures multiple times a day. Often finding the suitable medication for the seizures is matter a of long trial and error type of testing of multiple different types of medication. Still for some of the patients any medication is not able to decrease the frequency of the seizures enough. This type of patient is called *medically intractable epilepsy patient*. For these patients common treatment methods are installation of a vagal nerve stimulator and a surgery where the *epileptogenic focus* (the part of brain where the seizures start from), is removed. The latter is where both of the main clinical applications of the system are able to give invaluable information for the surgery planning. First of all the system can be used to localise the brain area to be removed but the pre-surgical mapping of functional areas is important as well, in order to avoid damaging any important brain areas such as language or speech processing. (Data 1j)

Normally the examination is referred by a physician in charge of treating the patient's epilepsy. But the systems of the case company provide only additional information for physicians making treatment decisions. Therefore the results of the examinations performed with the systems are always compared to the results of other imaging modalities and other information sources. The actual workflow of using the system for localising the epileptic activity is described below.

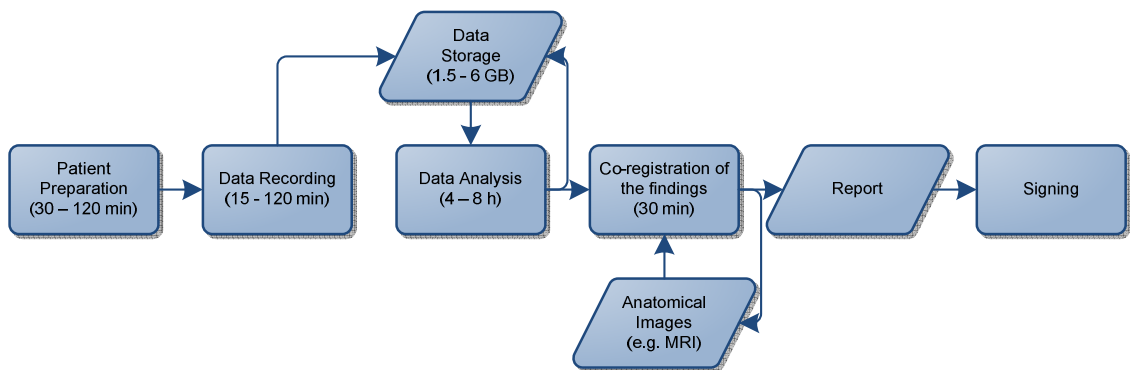


Figure 3. Case workflow using the system (Data 1i and j).

The various steps the users need to take when running an epilepsy study with a system provided by the case company has been illustrated in Figure 3. The process starts from preparing the patient for data recording (Bagic et al. 2011a: 349-350). The preparation step usually takes time between 30 and 120 minutes (Data 1j). After the preparation, starts data recording which takes minimum of 15 minutes, but may require longer time and even repetitions and some other means to increase the possibility of

finding the source of the seizures (Bagic et al. 2011a: 350-351 and Data 1j). It is recommendable for the recording to include both wakefulness and sleep. Once the data has been recorded, it is stored on a data server. The size of the data files created in this type of examination usually varies between 1.5 and 6 gigabytes (Data 1j). All these steps are normally performed under supervision of a laboratory technologist (Bagic et al. 2011a: 349).

When the data analysis is started, the data is usually downloaded from the data storage onto a workstation running the data analysis software. The analysis contains number of steps all including important decisions that are mainly based on the recorded data quality and the type of patient (Bagic et al., 2011a: 351-353). The analysis is performed manually by a highly skilled professional (see Section 3.1.2) and takes from the most skilled and experienced professionals between six and eight hours per patient (Data 1j). After the analysis, the analysed data is normally transferred back to the data storage for possible future use.

After the recorded data has been analysed, the location of the brain activity is known in relation to some predefined anatomical landmarks of the patient's head, called *head coordinate system*. As the technology of the system is not able to image the anatomy of the brain, at this point it is not yet known in which brain area(s) the activity is taking place. In order to reach this knowledge, the results need to be superimposed on anatomical images of the brain, which usually are taken by an MRI device. The operation where the recorded data and anatomical images are brought to the same coordinate system is called *co-registration* (Bagic et al. 2011a: 353), and normally it takes about half an hour. After the co-registration the results of the source localisation can be shown overlaid on the MRI image set. Usually these image sets are then pushed back to the imaging server where the original MRI image set was pulled from. (Data 1j)

After the co-registration, the results are reported back to the referring physician. The report should contain the following principal parts: patient identification and clinical history, technical details of how the measurement was performed, methods of data analysis, description of significant findings, and interpretation of the findings. As the referring physician usually has less knowledge of the technology, the interpretation is the most valuable part and it needs to be phrased using clearly and commonly understandable (physician) terms. The interpretation part also includes evaluating the correlation of the findings with the overall clinical picture of the patient. After signing the

report, the results are ready for the referring physician to use as an additional source of information for the treatment decision making. (Bagic et al. 2011b)

Altogether completing the workflow of a single patient takes 1-2 working days. Despite the time taken to complete the workflow, getting the final report signed takes in average nine days from the patient recording (Bagic 2011).

3.1.2 Recommended Staff Qualifications in Clinical Usage

A person interpreting results is required to have either medical (MD) or scientific (PhD) doctor's degree and should be specialised in neurology, paediatric neurology, or neurosurgery and have taken expertise training specifically for the technology in question. The expertise training should include all the steps of the workflow and should be at least six months long and contain independent analysis and reporting of at least 75 studies utilising the technology. (Bagic et al. 2011c)

Each customer using the systems also requires a laboratory technologist. In addition to qualification for electroneurodiagnostic technologist, six months of supervised clinical experience in a lab using the technology, and a formal training is required also. The training should contain all the various supportive routine tasks required to keep the system operational. (Bagic et al. 2011c)

Most of the laboratories using the systems use also unqualified staff to help in the data analysis, although the final reports of the studies are usually signed by a qualified person. (Bagic 2011)

This sub-section described the usage of the systems of the case company. Both the systems and their usage are complex and expensive. Completing a patient case also takes a long time especially due to the data analysis part that alone can take a full working day. Also the staff requirements are demanding. The next sub-section describes the current service offering of the case company.

3.2 Current Services of the Company

The current service offering the case company consists of six stages, as shown in Figure 4 below.



Figure 4. Current service offering of the case company over the customer lifecycle.

Figure 4 shows the current service offering of the case company. The offering consists mainly of services bundled to the system sales: installation site survey (pre-sales), site planning (pre-installation), system delivery, installation, integration to the customer's existing systems, training, and a warranty period covering periodical and corrective maintenances and possible spare parts. (Data 1d)

The prices of the bundled services are not separated from the price of the components of the system, and the customer price of the system is built only of the prices of these components (Data 1d). Internally the bundled services are accounted only as costs of the products. Even more hidden service of the company is actually delivered already before the customer decides to request for a quotation, as the company is heavily involved when the prospective customers build their business case proposals that are needed to apply for funding (Data 1c).

The customer may also invest in additional training, and some of the sales also include customer adaptations which usually consist of delivering and integrating additional peripherals from outside of company's standard offering. After the warranty period, the customer has the possibility to continue with a maintenance contract which contains periodical and corrective maintenances with possible spare parts and consumables. All maintenance contract components can also be ordered separately. The possibly

needed additional user support is mainly delivered as freewill. Additionally the customer can order moving, upgrade, and decommissioning services as separate projects. (Data 1d)

The case company has a tradition of employing the staff its existing customers in delivering trainings. The company has identified few reliable and respectable end users which the company employs to deliver the trainings together with the staff of the company. Usually the trainings are delivered by a group of two to three persons, out of which 1-2 is primarily working for the existing customers. The end users are supposed to be chosen so that their area of expertise meets the needs of customer receiving the training. Currently, using the end users to deliver the services is not managed in a controlled manner, and the pool of end users delivering the services is built pretty much based on their personal relationships with the staff of the case company (Data 1g).

The current value chain thinking of the case company resembles Porter's value chain where after closing the system sales project, the customer-supplier relationship moves purely to the hands of the service personnel of the supplier (Porter 1985: 36-61). Like Porter (1985: 48-50) describes, the boundaries between the value activities are not always very clear. In the case company this is visible in that majority of the services are sold as part of the systems. Still like in Porter's (ibid.) value chain, great majority of the services are delivered only after the sales and delivery of the systems.

As a summary, although the number of different types of services in the portfolio is rather high, the business model is highly product-centric as all the services offered are indispensable to get and keep the system in operating condition. By following the division between SSP and SSC (Mathieu 2001), the current services of the case company fall into the SSP area.

Next, the study analyses the competitive forces that the case company is facing due to rivalling offerings.

3.3 Rivalling Offering

For the past 15 years the global (incl. competitors) sales of the technology has stayed around 10 systems per year (Data 1a). In 2007 the technology still had three competing manufacturers (Lynch and Lynch 2007: 161) but since 2009 the case company has had a global monopoly of new clinically approved systems (Data 1a). A new competitor was founded in 2007 but until today it has delivered only refurbished systems of one of the deceased manufacturers. Another company is known of doing a preliminary market

research in Japan, but to the knowledge of the case company the possible new comer will not likely decide to enter the market (Data 1c).

The bigger threats for the company are some substitute technologies. Although the direct competitor often takes part to the bidding competitions organised by the customers, it has only once been able to win a deal of a new system and even that system is, at the time of writing, already a year late from the promised delivery date. Therefore the company faces a more challenging competition already before the bidding competition. As was mentioned in Section 3.1, the systems are among the most expensive systems a normal hospital has. Some substitute technologies can offer partially the same functionality with 1/100 of the acquisition cost, negligible running costs, and clearly better usability compared to the systems of the case company. This makes it challenging to justify the price of the systems to the customers' financial departments. The substitute technologies are so different in terms of functionality and price that the actual challenge is met already when the customers are planning and evaluating their business cases. The company has analysed that less than 40 % of the customers that have at least indirect needs for the technology, reach the business case phase. From these 40 %, less than ¼ ask for a proposal from the case company or initiate a bidding process. (Data 1a and c)

3.3.1 Revenues and Market Shares of the Rivals

The case company has identified four substitute manufacturers as possible competitors. In revenue, the rivals can be split into two groups, as shown in Figure 5 below.

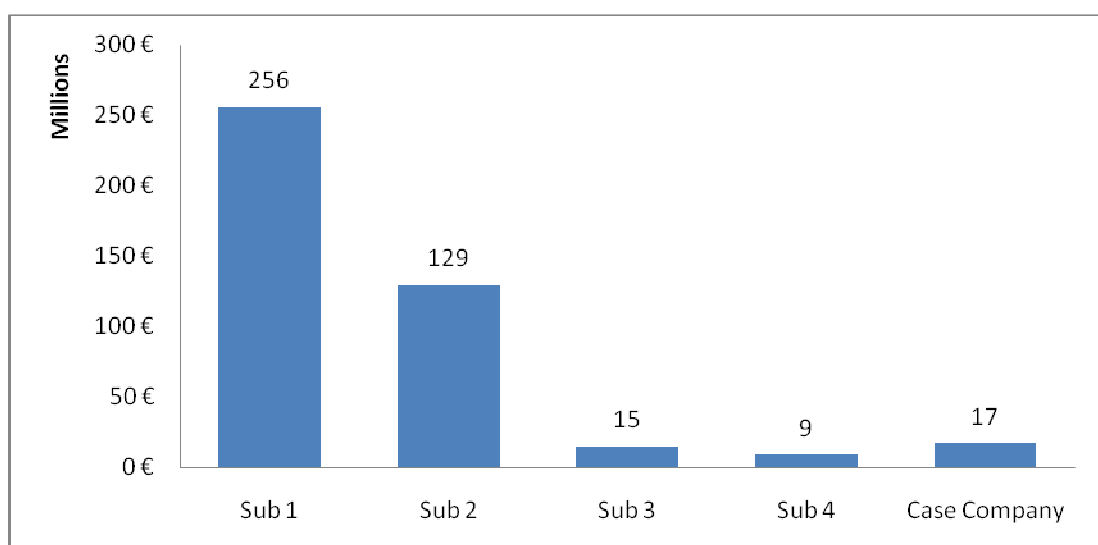


Figure 5. Revenues of the substitute manufacturers and the case company in M€ (Data 1A).

As shown in Figure 5, the biggest substitute manufacturer is 15 times bigger than the case company and the second biggest almost 10 times bigger, while the two smallest ones are on the same scale with the case company. In this study, these substitute manufacturers will be called *Sub1*, *Sub2*, *Sub3*, and *Sub4*, the numbering being based on their share of the markets. The revenue of the direct competitor is unknown but based on its sales numbers described earlier, its revenue cannot be more than a million or two.

The case company has also analysed the product market share of the rivals, as shown in Figure 6 below.

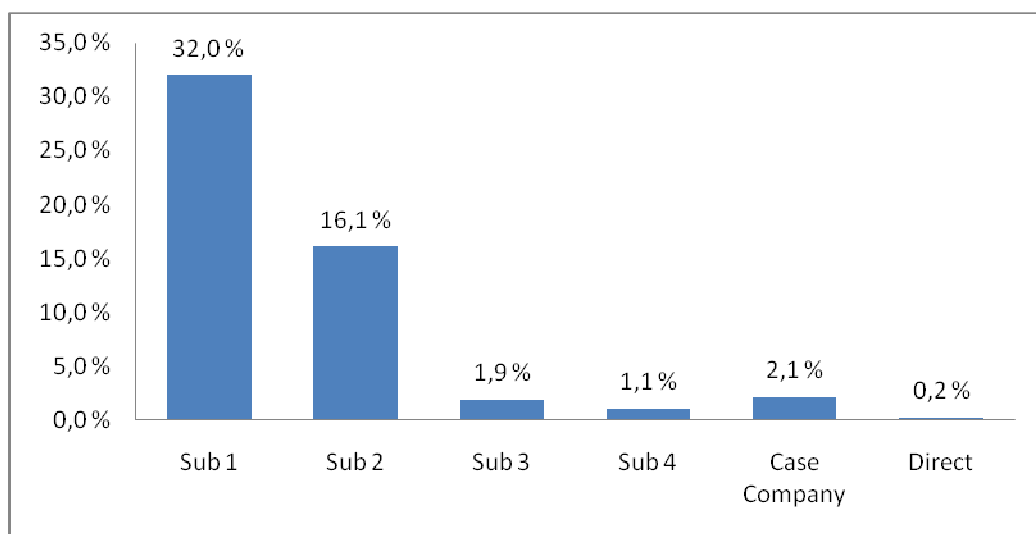


Figure 6. Product market shares of the rivals (Data 1A).

As shown in Figure 6, market share the companies can be split in two or three categories. The biggest of the substitute manufacturers has 32 % market share, the second 16 %, the case company 2.1 %, third substitute 1.9 %, fourth 1.1 %, and the direct competitor has 0.2 % (Data 1a). Although in market share analysis the companies seem to have unequal positions in the markets, out of the substitute manufactures the two smallest ones have been analysed as offering the most direct competition in the main target customer segment of the case company (Data 1a).

Next, the service offering of the rivals is benchmarked. The benchmarking also includes one consultation company which is offering services for the customers of the case company and its rivals.

3.3.2 Service Offering of the Rivals

Although the product market of the rivals was described above, the scope of this study is in services. Therefore this subsection benchmarks the service offering of the direct competitor, the substitute manufacturers, and a consultation company which is focused on offering services for customers of the case company and the rivals.

When the only direct competitor was founded, its strategy was to offer services to the customers of the two manufacturers that exited the business in 2007. The competitor is still mainly focused on services, and currently its service offering is similar to the offering of the case company. The offered services are site planning, installation, training, consultation, and maintenance (Data 1f).

Substitute manufacturer 1 (Sub1) is a substantially larger company than the others described in this study and it has a vast variety of products for healthcare. The basic service and support offering of the company is limited to technical support, training, maintenance, and manuals. In North America though, the company also offers consultation services. As consultation, they offer equipment and networking solutions, help in designing patient workflows, marketing tools to help expanding the customers' business, and project management. (Data 1f)

Substitute manufacturer 2 (Sub2) has a large variety of brands and products for healthcare and research. Based on its website the only service offering of the company is technical support and training. (Data 1f)

The third biggest substitute manufacturer (Sub3) has much smaller product offering than the two bigger rivals. The service offering of Sub3 is very similar to Sub2, as they offer only technical support, maintenance, and training. (Data 1f)

The smallest substitute manufacturer (Sub4) is focusing on a core product whose different versions it sells based on the customer's application. The service offering follows the example of Sub2 and Sub3, as the offering consists of installation, maintenance and training. (Data 1f)

The most interesting service offering can be found from a consultation company that is actually a spin-off of a customer of the case company. The consultation company gives the researchers of the customer organisation the possibility to sell their expertise as consultants. Although offering is communicated unclearly on the website, their vast offering contains at least the following services. They provide medical imaging as a

service by utilising their devices, including a system delivered by the case company. This offering includes also legal consultation like behavioural evaluation. The company offers also help for other labs in their system acquisition projects. This contains at least designing of the workspaces and choosing correct equipment to acquire. The company is also claiming they can consult researchers in all stages of their work, from starting up a lab to analysis of acquired data. They also offer training and education to the staff of their customers. The offering includes also access to an online software package that helps in collaborational studies of the customers. (Data 1f)

All in all, the rivalling manufacturers are at maximum on the same level of service offering as the case company. All the manufacturers are product-centric and they offer only SSP type of services. The consultation company described above is a benchmark of how large variety of services could be offered in the field. By expanding its service offering, the case company could further differentiate itself from the rivals but based on the example of the consulting company, choosing the correct services and marketing them understandably can be challenging.

This section described and analysed the competing offering the case company is facing. The main competing offering for the case company is coming from the manufacturers of substitute products. The first subsection focused on describing the rivalling companies and the product offering while the second part focused on the service offering the companies. The next section describes and analyses the customer that the case company is offering its products to.

3.4 Customers

Due to the high price, complex competence requirements, and the nature of the usage of the systems, the customers of the case company are never individual persons but a group of highly specialised professionals of various educational backgrounds. The customer organisations can be split into two core types and their combinations. Traditionally the customers have been mainly brain and physics research institutes trying to learn how the brain functions, but a decade ago the clinical usage started to slowly increase. Now majority of new customers have clinical usage in key role (Data 1c). Still today the customers mainly include the world class universities (e.g. Oxford and Harvard) and hospitals (e.g. Cleveland Clinic), as the technology is not so widespread that it would have reached other organisations yet.

When limiting a customer only the lab where the system is installed and used (i.e. not seeing the customers as complete hospitals), the customers are providing services by utilising the technology provided by the case company. From this point of view, the customer's customer is the referring physician. In this respect, the customers might possess competences required by the case company on its way towards service business. The customers also have the experience in the services offering of their other providers, which could be valuable information for the case company. Next, the study analyses the current state of customer satisfaction and customer expectations for services.

3.4.1 Level of Customer Satisfaction

The latest customer satisfaction surveys conducted by the case company were conducted in 2011 and 2012. As the results of the surveys were similar, the company has combined their results and reported them holistically. The surveys were conducted as quantitative questionnaires where the customers were asked whether they are satisfied or non-satisfied with the 52 pre-defined touchpoints to the case company and its products. The satisfaction levels have been formalised into four levels: mostly dissatisfied (0-24 %), somewhat dissatisfied (25-49 %), mostly satisfied (50-74 %), and very satisfied (75-100%). The touchpoints are of generic form as the same surveys have been used also for other product lines of the corporation. The touchpoints are grouped under topics Marketing, Sales, Installation, Products & Services, Education & Training, and Customer Service & Support. The results are not separated between different customer segments but cover the whole customer base of the case company. (Data 1b)

The report revealed that with the marketing and sales touchpoints the customers were mostly dissatisfied. The dissatisfaction was caused especially by poor availability of system information and the frequency of contacts. On the opposite, the customers were mostly satisfied with installation of the systems. (Data 1b)

In products and services area, the biggest concerns were software usability and operational costs. The main operational costs are liquid helium usage of the system (50000 - 200000 €/a depending on region) and staff (> 100000 €/a). The staff costs are high, as operating the system requires highly educated and specialised personnel all the way to PhD level in physics (see Section 3.1.2) and analysing the data of a single patient can take up to two working days (see Section 3.1.1). Especially for customers with smaller patient volumes, the unavailability of labour with the required competences

to operate the system and analyse data measured with it is an important issue. (Data 1b) The company considers the high operational costs together with the poor availability of staff as the main the reason for the customers struggling in making profit from the services they offer by utilising the systems of the company. Even the customers with highest number of patients per year are able to barely overcome the breakeven point. (Data 1c) Especially in the US markets the hospitals are mainly private companies with the goal to create profit for their shareholders, so justifying the acquisition of a capital device that is known of not creating profit is hard for these customers.

The customers are mostly or very satisfied in education and training activities as a whole. Still satisfaction on availability of training, duration of training, and quality of training documentation touchpoints stays on somewhat dissatisfied level. The company has noticed that this creates a risky combination together with the fact that the availability of skilled labour is poor. The company is visioning a continued learning program to overcome the issue. (Data 1b)

In customer service and support areas the customers are mostly or very satisfied with the activities of the company. Still the customers are somewhat dissatisfied with the physics support of the company. (Data 1b)

As a summary, the customers are happy with the technical services and quality of training delivery. Worst dissatisfaction was focused on the usability of the system and its operational costs but also the training and physics support point out from the results. The next subsection describes the expectations that the customers have towards the service offering of the case company.

3.4.2 Customer Expectations for Services

Two years ago the case company conducted a study (Data 1e) to map the customer expectations for services. The project was partially funded by TEKES and was executed as a collaboration of the case company, Finpro, and a business consultancy company. The study included interviewing of eight customers, consisting altogether 19 persons, in five countries.

The main focus of the study was on suggesting service ideas developed by the case company. The suggested services were turnkey delivery, application service desk, training and coaching, application development and maintenance, remote analysis, data warehousing, and application health check. The clinical application related

services gained interest of the majority of the interviewees but some of them considered them as services that should be “built in” and not behind extra charging of the customers. Training was seen as a key element which could be much stronger based on the interviewees. The ICT related suggestions, remote analysis and data warehousing, were seen problematic in data privacy sense, although the French customers seemed to be familiar with them in other parts of their operation.

Additionally the study confirms that the customers are moving towards clinical use. The results of the customer satisfaction surveys were confirmed as well, in that the main customer dissatisfaction arises from the usability, staffing, and costs which are seen as the main barriers in their transformation to clinical use of the systems. The customers would be willing to get outside help to reach their targets. They would also like to collaborate more with each other, in order to develop standard procedures for clinical use. Especially the US customers see outsourcing of their functions as a routine in their hospitals.

In general, the interviewees saw the case company to be lacking credibility to offer the services suggested in the study. They consider the company and its products to be too engineering oriented and lacking clinical expertise. They did see the case company to be able to build the missing competences if it so decides, though. The customers also seem to be willing to collaborate in building the competences and in providing the services. In the latter option they see that the case company could focus on facilitating the data exchange between the service providers and receivers.

This subsection described and analysed the service requirements of the customer base. As a summary, the interviewees need and want help in increasing their efficiency and showing the clinical benefits of the systems over other techniques. The interviewees see the current user base to have the best clinical knowledge available, and see the case company lacking the same knowledge. They see that the current research and clinical applications are somewhat scattered and would like to build bigger collaboration networks between the users. In the interviews the service suggestions were not defined to the interviewees (Data 1c). Instead, the questions were in the form of “Would you like to receive a remote analysis service?” and the interviewees had to imagine by themselves what would this remote analysis actually mean and how it might be delivered. This leaves room for questioning whether or not all the interviewees have actually imagined the suggested services in the same way as

the case company. Next are described the existing user communities of the customer field.

3.4.3 User Communities and Societies

Although the customers were claiming that they would like to collaborate more with each other (see above), the field already has multiple user communities and societies whose aim is to enable collaboration. During the research, nine user communities or societies and three regularly organised conferences were found that have a public website. But based on the review of their websites, the communities and societies are scattered and do not seem to interact much. Additionally, most of the sites are old fashioned static pages containing mainly outdated information, and not giving the tools for collaboration even between their members. The sites with active discussion are purely research focused and mainly discussing on specific open source software packages. Any of the websites reviewed would not help new clinical customers with their steep learning curve. (Data 1)

3.5 Summary

Based on the current state analysis above, it is clear that the systems offered by the case company do not match with what a clinical customer calls a clinical device. Actually during the brainstorming around the preliminary proposal, Customer D phrased the situation as “feeling of being fooled by the case company” (Data 2). The systems are not just very expensive to acquire and maintain, but using them is complicated and requires highly educated staff. Up to date, any medical school in the world has not taken this technology as part of their MD training, so only instances educating on the usage are research oriented universities. That makes finding staff with the competence required in clinical field challenging.

Although the case company is already offering numerous services, they still focus on serving the systems (SSP), not the persons using the systems (SSC). In other aspects of its operations the company is purely product centric as well, as are its main rivals. The customers have also noticed this focus and are expressing it in the customer satisfaction surveys. The company has done good preliminary work on the previous services study as its results and feedback give good grounding on proposing new and refined services to the customers and the management of the case company. Together with the analysis of existing user communities and societies, it became clear that the new clinical customers are struggling in starting their operation due to lack of available expertise. Unless a customer organisation is able to hire an experienced user, they do

not have any means to get the required help in starting up their operations. The service ideas proposed in the study will try to address these issues.

The next section introduces the methods used for building the conceptual framework of the study. After that, the framework is used to build a proposal of new service ideas that address the issues found in this section.

4 Best Practice of New Service Idea Generation

This section describes the building process of the conceptual framework of this study (see Section 4.3). The framework consists of five general level service types which have been split into four service elements that describe different aspects of the services. As brought up by Goldstein et al. (2002: 122), service design does not have any universal definition. Additionally, this study does not aim at full design of a service, but instead it proposes service ideas that could help the case company reach its goals.

4.1 Service Elements

This section describes the elements that will be used to describe the proposed service ideas of the study. In order to find the key elements, a literature review was conducted. It was found out that business model concepts and service model concepts are often described by using similar elements. Therefore this section first explains why the business model concepts were not chosen to be used in the conceptual framework. After that, the section analyses some service model concepts, and finally focuses in modifying a service model concept proposed by Frei (2008) to match the specific needs of the study.

There is no universal concept of a business model (Lambert and Davidson 2012: 669) which becomes evident through the vast variety of concepts used in business research over the last two decades (Lambert and Davidson 2012; Osterwalder 2004). Additionally, as Linder and Cantrell (2000: 2) point out, often people are talking about a business model, although they actually cover only some parts of a business model. During the literature review were found also some service model concepts, which, in the end, are like business model concepts but modified to meet only the needs of describing a service model. As this study is proposing new service ideas, not complete business models, the focus of the literature review was put on the service model concepts instead of business model concepts.

Similarly to business models, the service models do not seem to have a universal concept as well. During the literature review were found four definitions for a service model concept: Clark et al. (2000), Edvardsson et al. (2000), Fitzsimmons and Fitzsimmons (2008), and Frei (2008). The elements of the service concepts have been listed in Table 5 below.

Table 5. Selection of Service Model Concepts.

Clark et al. (2000)	Edvardsson et al. (2000)	Fitzsimmons and Fitzsimmons (2008)	Frei (2008)
Form and function	Customer needs	Delivery system	Offering
Service experience	How to satisfy the needs	Facility design	Funding mechanism
Service outcome	What to do for the customer	Location	Employee management system
Value of the service	How to achieve all this	Capacity planning	Customer management system
		Information	
		Quality	
		Service encounter	
		Managing capacity demand	

Clark et al. (2000) define a service concept to consist of *form and function* (how to deliver), *service experience* (how customer experiences), *service outcome* (benefits and results to customer), and *value of the service* (benefits vs. costs to customer). The elements of Edvardsson et al. (2000) range from *detailed customer needs*, *how to satisfy the needs*, *what to do for the customer*, and *how to achieve all this*. Fitzsimmons and Fitzsimmons (2008) split their service model elements into two groups. 1) The structural elements are *delivery system*, *facility design*, *location*, and *capacity planning*, whereas 2) the managerial elements are *information*, *quality*, *service encounter*, and *managing capacity demand*. Frei's (2008) service model concept consists of four elements, which are *offering*, *funding mechanism*, *employee management system*, and *customer management system*.

Although all the frameworks above are very well explained by their authors and they make a perfect sense at least in the environment the authors designed them for, they mostly feel too abstract and/or detailed for this study. Only the elements introduced by Edvardsson et al. (2000) and Frei (2008) come close to the requirements of this study. Out of those two, Frei's concept feels more self explanatory and complete, by taking into account also the employee and customer management, and is therefore chosen as the basis for the conceptual framework of the study. Still even those elements need some modifying in order to meet the requirements of the study. As the customers, who the services will be proposed to, are physicists and/or medical doctors, neither the names nor the content of the elements should include any management jargon. Also as this is only the initial idea generation phase, the elements should not be too restrictive in order to enable fluent discussion of ideas. Next this modifying is explained in deeper.

Offering

The first service element described by Frei (2008) is *offering*. The offering of a service must meet the needs of an attractive group of customers but a single service model cannot meet the needs of all the customers. Therefore the management of the service provider must be clear on which attributes the service model is competing on. This means the target customer segment must be well analysed and based on the analysis must be decided which areas the offering is reaching for excellence and which it allows to stay on inferior level. (Frei, 2008: 72)

At this point of idea generating, it is not yet feasible to define the offering that strictly. As Johnston and Clark (2008: 40) argue, a proper service model is more complex than a good idea. As this study only proposes high level service ideas and tests their feasibility among few customers, especially deciding the areas to leave out of the scope of the offering would be too early. If the case company decides to continue even further on with some of the proposed services, only then it should think about defining all the elements more strictly.

Funding Mechanism

Frei (2008: 73) introduces four different options for funding the delivery of the service. As the first option he mentions palatable increase of prices. As an example of this option Frei uses Starbucks, where the products are slightly more expensive to cover the expenses caused by the customers spending very long times in the branches.

Second option is to create a service which actually lowers the costs of the service provider. As an example of this option, Frei (2008) uses Progressive Casualty Insurance, where the company sends its customer representatives to go on-site of the incidents to do the insurance claim for the customer. The company has found out that this method has enabled it make substantial savings in its insurance fraud costs. (Frei 2008: 73)

As the third option Frei (2008) mentions the possibility for future savings. As the example he uses Intuit, a software company which offers free customer support. The increasing number of customer contacts gives the R&D department additional input for development, which then results in better products which leads to less customer support contacts. So in the end the customers get both free support and better products while the company does not need to keep remarkably bigger customer support department.

The last service funding option of Frei (2008) is changing the service to be provided by the customer itself. By designing the service well, it is possible to reach a win-win situation again. As an example of this option, Frei uses self-service check-in of airlines, which saves the customers' time and gives easier choosing of the preferred seat. Here the key feature is that user interface of the check-in application is greatly simplified as compared to the UI that the airlines' check-in staff is using (Frei 2008: 76).

Limiting the funding mechanism to these four options would be slightly too restrictive for this study. All the four mechanisms described above rely on some level of synergy between the offered service and other already existing or future offering of a service provider. Therefore other mechanisms are also used in both, the case examples of Section 4.2 and in building the preliminary proposal in Section 5.

Provider Requirements

The third element of Frei (2008) is *employee management system*. In service business, the employees have even more important role in creating the companies' success than in product business. Frei (2008) instructs to start designing this element by answering two questions: 1) what makes the staff able to deliver the offered service and 2) what motivates the staff to demonstrate excellence in the offered service. The answers to the questions can be derived from the service attributes defined in the offering element and the company specific policies and programs. Frei (2008) also reminds that getting

both great skills and attitude needed in delivering the offered service is expensive and therefore the company needs to compromise one or the other. (Frei 2008: 75)

The element described above suggests a rather deep approach. At this point of generating ideas for new services, it is not meaningful to go that deep into employee competences, since it is not yet clear who would be the provider of the new services. Additionally, some of the proposed services may require such a level of technical resources that they turn out to be bigger challenge than the employees. Therefore the third element is called *provider requirements*. This element is used to describe in high level what resources are required to provide the service in question.

Receiver Requirements

In services, also the customers have an important role in the service delivery as they are an active part of the service. For managing the customers, Frei (2008) uses similar methods as for employee management. The actions include choosing the correct customers, documenting their roles in the service design, mapping the needed competencies, and training and motivating the customers. The training can be avoided by simplifying the actions that the customers are taking like is done in the example of self service check-in of airlines. (Frei 2008: 76)

The *customer management* element of Frei (2008) is similarly incompatible with the requirements for this study as was Frei's (2008) *employee management* above. Similarly, the solution for the issue is basically the same: the fourth element is called *receiver requirements* and it is used to describe on a high level the resource requirements for the customer receiving the service, to able to do its part of the service in question. These requirements will mainly be competencies but possibly also technical issues. An example of a technical requirement could be an unlimited high bandwidth Internet access at the customer site, which is not a commodity in hospital environments. In order to avoid confusion, the term *customer requirements* is not used, as it points more to the requirements the customers have for the provider.

This sub-section introduced the elements that this study uses to describe the proposed services. These elements are 1) *offering*, 2) *funding mechanism*, 3) *provider requirements*, and 4) *receiver requirements*. The next sub-section introduces some existing service types that match with the SSC classification.

4.2 Service Types

Based on the examination of various sources and the current state analysis, this study suggests five different types of services to be used in generating service ideas that could meet the needs of the customers (see Section 5). At this point, the service types are kept as abstract as possible in order to avoid restricting the idea building for the preliminary proposal of the study. The main method to introduce the service types is business case examples. The example services have been further analysed by utilising the four service elements introduced in the previous sub-section. The analysis of the example services is summarized in Table 6.

4.2.1 Crowd Work

As the number of crowd working platforms is currently increasing rapidly, the variety of their offering is covering more and more of different types of needs. For some platforms, crowd working means micro-tasks (e.g. Amazon's Mechanical Turk) while on the other end of the spectrum are the platforms for completing complete R&D tasks (Kittur et al. 2013: 1301). The example case of this service type was chosen due to its interesting and somewhat controlled offering aimed at a rather specific customer segment.

The company called Solved - The Cleantech Company Ltd has built a crowd work website that gathers together experts of cleantech sector and allows the customers to hire the experts as consultants. When the experts register to the service, they are required to mark their key areas of expertise. These areas can be things like water, energy, design, processes, finance, construction, policy etc. Each expert also uploads their photo, tells what company they are primarily working for, and gives a brief introduction of themselves. The experts are primarily working for other cleantech companies than Solved and they only provide their expertise for Solved as project type of work as an addition to their primary work. The experts are providing their services as individuals, not as representatives of their primary employers. (Solved 2014)

Like the example of the consultation company benchmarked in section 3.3.2 shows, it is rather easy to imagine services that this kind of expert pool could offer, but it can be challenging to communicate clearly the offering for the customers. Solved has chosen another approach for the dilemma by listing the competences of the experts and describing only a few example projects completed by the expert pool. This approach gives the customer a free hand to suggest a project, which the management of the

expert pool then, in collaboration with the customer, shapes into a project fitting the experts of the pool.

The customers of the service come from a variety of fields as well. They can be e.g. industrial companies, real estate developers, municipalities, nations, or investors. The customers are required to fill in a web form where they define their background and briefly describe the challenge they would need help with. After this, employees of the company contact the customer and they define the required competences of the experts in collaboration with the customers. Based on the requirements, the company then offers to the customer experts, which the company thinks would best fit the requirements of the customer. Up to this point the service is free for the customer but once the experts have been chosen and they start solving the challenge in collaboration with the customer, the customer is required to pay a fee to the company, which then pays the experts. Next, the service is described by utilising the four service elements introduced in Section 4.1. (Solved 2014)

Offering

In this service example, the company has an offering for two parties, both the customer receiving the service and the experts delivering the service. The customer gets access to high quality expertise from a wide variety of backgrounds, cultures, and knowledge. Normal consultation firms are not able to efficiently provide such a variety, especially in the areas where the experts are not needed often enough to hire them as full time employees of the company.

As the experts are offering their expertise through Solved only as an addition to their primary jobs, it is important to keep the experts motivated, as otherwise they would just stick to their primary jobs. Therefore it is important to think also what this service can offer to the experts. The experts can get possibilities to build their professional networks, promote their personal expertise, and benchmark the companies and industries which they do not meet in their primary work. Solved also states that the experts are able to earn more and faster, but a confirmation for that statement was not possible to get during the examination.

Funding Mechanism

As this service is the only offering of the company, it is not able to fund it through any synergy benefits and future savings are hard to imagine. Therefore the service must be funded purely by charging the customers.

Provider Requirements

Similarly to the offering element, where was an offering for two parties, there are also two parties providing the service, the company and the experts. The service provided by the company is organising the experts with correct competences to collaborate with the customers. To do this, the company needs to develop and maintain the website, although it is a rather simple site. A bigger challenge is to build up and maintain the network of experts, especially abroad, which is why the company needs to consider things like expert motivation, feedback, and pay (Kittur et al. 2013: 1302). Also the company, being between the customer and the experts, must take care that the customers receive the overall service level they are expecting.

The experts are providing the actual consultation service. The requirements for them are good collaboration competences and a flexible employer that allows the experts to conduct projects of their personal interests. Naturally the experts also need to be able to provide the expertise the customer expects them to have. (Kittur et al. 2013: 1302)

Receiver Requirements

The requirements for the customer receiving the services of both the company and the experts are similar to the requirements of any consultation/outsourcing project. The customer needs to define the needed competences and the scope of the project well and collaborate openly with the experts.

4.2.2 User Community Portal

A community portal is a web-site created for people sharing some common interest. Often this common interest is some commercial product, and the sites are usually built by the users of that product. In some cases, the manufacturer of the product sees a user community portal as a possibility to serve its customers and to market its products.

Philips Healthcare can serve as an example of a medical device company that has built a user community portal called NetForum Community for the users of its CT, SPECT, PET, and MRI devices. In Philips' case, the portal contains only a large knowledge base with various types of content. The portal contains e.g. latest news, scientific publications, case studies, white papers, presentations, and best practices. While most of the content is created by the company, the users are also allowed to become contributors, and they can submit at least application tips, case studies and settings (called ExamCard) used for imaging specific type of patients on a specific model of a

device . All submitted content is reviewed by an editorial board of the portal and once the content is available for the users, they have the possibility to rate the quality of the content. The portal does not have any kind of discussion board or chat functionality. Next, the portal is described by utilising the four service elements introduced in Section 4.1. (Philips 2014).

Offering

The portal gives the users a vast amount of content that they can use in benchmarking the methods of other Philips customers. It helps both the new users to get their operations fluent faster and the existing customers to further develop their operations and to start using new applications offered by Philips.

Funding Mechanism

All the content of the portal is free of charge even for non-Philips customers. Therefore the funding of the portal relies on income of other businesses of the company, most probably on the product sales.

Provider Requirements

While the web site itself is rather simple, the main challenges are in managing the content. Although the company does not take official responsibility for the quality of the content, all submitted content is reviewed by skilled persons. The site contains some almost old exam cards dating back to almost a decade, but without the knowledge of the field, it is impossible to say, if the company takes actions to ensure that all the content stays up-to-date.

Receiver Requirements

From the users accessing the content this service does not need much. They need to be aware that they are using the content on their own risk and that they have to ensure its correctness before using it in patient experiments.

4.2.3 Telemedicine

Telemedicine means a service where, by using telecommunication and information technologies (ICT), healthcare is provided remotely. Telemedicine covers services ranging from sharing patient information through a mobile phone application and online discussion groups to remote medical education and interpreting medical images. (ATA 2014)

Telemedicine is especially popular in interpreting radiology images, as already in 2006, hundreds of U.S. hospitals were using overseas teleradiology services (Wachter 2006). Virtual Radiologic, Inc (vRad) started in 2001 by offering its clients preliminary radiologic interpretations during nights, weekends and vacations. Since then, the company has expanded its offering to final and subspecialty interpretations as well. The interpretations are done remotely by utilising teleradiology technology. Next, these interpretation services are described by utilising the four service elements introduced in Section 4.1. (vRad, 2014a, b, c)

Offering

By utilising the services provided by vRad, the customers reach higher efficiency in their operations. The main reason for the higher efficiency is that vRad is interpreting the images 365 days a year, 24 hours a day, what a normal hospital cannot achieve efficiently. By using vRad, the customers can also cover the absence (holidays etc) of their own radiologists and handle peaks in the number of patients, for example in emergency situations. Additionally, the services help the customer to meet infrequent demand for subspecialty trained radiologists.

Funding Mechanism

Charging the customers per number of interpretations is the only source of income for the service. The company employs more than 400 radiologists (vRad 2014b), which allows for the benefits of economies of scale.

Provider Requirements

Doing clinical diagnosis in an established area like radiology in the U.S., requires staff that is licensed according to the local regulation. The company sees its quality assurance program as a competitive factor (vRad, 2014b), and all the actions done during the interpretations are documented so that they can be reviewed afterwards. This type of service requires investments in ICT as well, in order to enable fast data transfers between vRad and the customers and storage of all the data.

Receiver Requirements

For the customer, the main challenges are in the internal processes and regulatory matters. The customer needs to change its patient handling process, so that the in-house analysis is replaced with remote analysis that is done by persons not employed by the customer's organisation. Also the regulatory department need to be convinced

on the patient data security, and the ICT department needs to allow data access for the service provider.

4.2.4 Computer Aided Diagnosis

Computer aided diagnosis means that part of medical imaging based diagnosis is handled by a computer. Usually CAD applications are used to automatically detect some specific phenomenon (e.g. lung nodules) in a medical image. CAD has been systematically developed since the 1980s and since that it has become a major research subject in medical imaging and especially in radiology field. The output of the computerised part is utilised by an imaging specialist (e.g. radiologist), meaning the CAD development does not aim at replacing these specialists. Instead, the specialists use the output of CAD applications as a second opinion leaving the final judgment to the hands of the specialist. In this usage scenario the potential gain of CAD is in combining the specialist's competence and computer's capability. Another research thread, called *automated computer diagnosis*, tries to replace even the specialists by software. (Doi 2007)

An example of this type of service/application is NeuroQuant® from CorTechs Labs, Inc (2014). NeuroQuant® is software that does automatic segmentation of 3D images of brains. Based on the segmentation the software returns the user both the segmented images and printable patient reports. In building the reports the software utilises a database of control subjects, and compares the volumes of the brain segments of the patient in question to the control subjects. The information returned is important in diagnosing some brain disorders like Alzheimer's disease. The software has two versions, one that is installed on customers' own hardware and another that is run as a cloud service by CorTechs. Next the cloud version of the application is described by utilising the four service elements introduced in Section 4.1.

Offering

The application offers fast analysis and comparison of brain structures without other user interaction than uploading the images to the provider's servers. This results in significant savings in staff expenses and higher patient throughput.

Funding Mechanism

The whole operation is done by the software without interaction even from the service provider staff. Therefore the staff costs are significantly lower than in traditional manual methods.

Provider Requirements

The provider needs to build trust towards the customer base and regulative bodies especially in data privacy issues. Also the provider needs high investments in reliable computing power and Internet bandwidth.

Receiver Requirements

The customer needs to work on its internal processes and regulatory affairs in order to get permission to send patient data outside. Also the ICT department is needed to get the required bandwidth to quickly upload the images from the customer's imaging server to the provider's server.

4.2.5 Cloud Storage

Cloud Storage offers certain advantages that make it very appealing for data owners. The advantages include on-demand self-service, ubiquitous network access, location-independent resource pooling, rapid resource elasticity, usage-based pricing, and transference of risk. For the data owner this means e.g. possibility to outsource the data management, flexible and location independent access to the data, and avoiding capital investments to hardware and software. (Wang and Ren 2010)

Albeit cloud storage has already changed the ICT world both in consumer and business environments, its data privacy have been questioned repeatedly (Wang et al. 2013: 362). Data security concerns were also one of the reasons why the customers of the case company did not find cloud storage a tempting service when it was proposed last time (see Section 3.4.2). Therefore ICT companies and scholars are working hard to find solutions for ensuring the security. One example of this progress is the work done by Wang et al. (2013) which proposes a solution for auditing the remotely stored data by a third-party auditor, without revealing the actual data even to the auditor.

A service provided by TrueVault, Inc is used as the case example of cloud storage. The company is offering data storage service for companies developing medical products or services, which differs from the other example services that are offered for the end users. As the service is meant for storing patient data, the company is promoting its exceptional focus on data privacy and medical regulation. Next the service is described by utilising the four service elements introduced in Section 4.1. (TrueVault 2014)

Offering

The company is offering an easy and secure method for storing patient data so that the data is reachable over the Internet. The company claims that the service fulfils the medical requirements in the USA. The application programming interface (API) is well documented, and the documentation is freely available on the website of the company. The API also relies on widely used standards and architectures like HTTPS and REST, and does not therefore need any special programming skills, and utilising the service does not depend on any proprietary tools.

Funding Mechanism

Similarly to the Crowd Work example (Section 4.2.1), TrueVault is not able to get any cost benefits from synergy with their other operations. Therefore the funding mechanism is fully relying on the income from the customers.

Provider Requirements

TrueVault needs special competences of medical field. They must have good understanding of the medical regulation and they need to be able to prove that they fulfil the requirements. Although they have good documentation available, they do offer developer support as well. Like in any ICT service, the company needs the resources to acquire, maintain, and develop their ICT infrastructure in order to make sure the service can manage the highly varying load coming from the customers and end users.

Receiver Requirements

The companies embedding TrueVault to their products or services, need certain level of technical competence in order to efficiently and reliably utilise the storage. They also need to train their own customer support to be able to solve possible issues together with TrueVault. Covering the modest monthly charge of TrueVault should not be an issue for a commercial company.

4.3 Conceptual Framework

The conceptual framework (see Table 6) of this study is built around the elements of a service model introduced in Section 4.1 and the service types introduced in Section 4.2. The service types have been listed on the horizontal axis of Table 6.

Table 6. Conceptual Framework

Service	User Community	Crowd Work Portal	Telemedicine	Computer Aided Diagnosis	Cloud Storage
Offering					
Funding					
Provider Requirements					
Receiver Requirements					

By placing the service elements as the vertical axis, the framework gets its third dimension where each of the service types has been divided into elements. This division simplifies the proposal building, which is explained in Section 5. As an example of how the framework works, the framework in Table 7 is filled with the example services of Section 4.2. The additional Provider row is added simply to express the names of the example service providers.

Table 7. Conceptual Framework filled with the example services

Service	Crowd Work	User Community Portal	Telemedicine	Computer Aided Diagnosis	Cloud Storage
Provider	Solved	Philips Healthcare	vRad	CorTechs Labs	TrueVault
Offering	Customer: Access to large variety of expertise Experts: Additional income, continuous learning	Learn faster, save time in developing new experiments	Low staff costs, get results faster, address the infrequent demand for subspecialty	Low staff costs, fast results	Easy storage of patient data, guaranteed data privacy
Funding	Charge the customer	Income of other functions of the company	Charge the customer, economies of scale	Automatic execution: low staff costs	Charge the customer
Provider Requirements	Company: Recruit and motivate the experts, offer correct expertise to the customer Experts: Collaboration competences, flexible employer	Manage the content	Highly educated staff, bullet proof quality control, ICT	Excellent data privacy, scalable computing power	Meet the regulations, ICT
Receiver Requirements	Well defined competence needs and scope of the project. Collaboration with the experts.	Review the content before utilising	Internal processes, regulation, ICT	Internet access from imaging server, high bandwidth, permission to send patient data outside	ICT

5 Generating New Service Ideas for the Preliminary Proposal

The conceptual framework of this study (Section 4.3) is a two dimensional matrix. On the horizontal axis of the matrix are various SSC service types and on the vertical axis the types are split into four service elements. In this section of the study, the framework is used for generating ideas for new services to be added to the company offering. First some preliminary service ideas are generated based on the current state analysis done in Section 3. Then in Section 5.2 the ideas are shown in the form of the conceptual framework. That framework is then used as the basis for interviews, where key customers of the company are asked for their insight on the proposed ideas. The insights of the customers are recorded, and used to build the final proposal, which is then taken to the company management for evaluation (see Section 6).

5.1 Preliminary Service Ideas

The service ideas below are built to meet the customer requirements identified in Section 3.4.1 and findings of the pre-study described in Section 3.4.2. The ideas are based on the service types described in Section 4.2. Some of ideas have different name than the original service types, in order to better describe the meaning of the service ideas for the case company and its customers. Like the service types in Section 4.2, the service ideas have been described by utilising the service elements introduced in Section 4.1 as well.

5.1.1 User Community Portal

As mentioned in Section 3.4.3, there is already a large selection of communities and discussion boards for the users of the technology. Still in Section 3.4.2 it turned out the customers feel there is not enough collaboration between the customers. One reason for this dilemma could be that the large number and variety of communities is actually dividing the customers into silos. Therefore the first preliminary service idea is to build a high quality, multifunctional user community website. The portal should cover equally both the research and clinical fields, as they both support each other and, like mentioned in Section 3.4, even the most clinical customers of the case company are doing also research. The already existing community websites have a good selection of functionality, but to get them all under one umbrella could help in uniting the customers. Still the goal would not be to compete with the existing offering.

In addition to traditional user community portals like the example in Section 4.2.2, the community could e.g. gather all publications utilising the technology under one umbrella, run collaboration projects for creating standards, share and discuss best practices, have a job board, organise events, benchmark other industries/technologies, and market the technology to outsiders. The community should be open for all users of the technology, no matter which manufacturer they have bought their systems from, or what software suite they are using. Also the community could have a section giving information for the types of patients that could benefit from the technology. As in the example community, the community should have some kind of reputation building functionality, to motivate the users to discuss and share their knowledge. Next the user community portal idea is described by utilising the service elements introduced in Section 4.1.

Offering

A strong, active, and professionally maintained user community portal would help the customers to collaborate with larger amount of experts than currently. By collaboration the customers could e.g. develop new applications for the technology, organise common marketing efforts, and learn from each other.

Funding Mechanism

Normally the user community portals are free of charge for the users as the companies use the communities for collecting customer insights, testing new ideas etc. If the portal would really help the customers in meeting their goals, even one more sold system would cover the expenses of the community for years.

Provider Requirements

The portal would serve mainly as a discussion board, meaning a rather simple website with low ICT requirements. Still managing and especially building the portal and persuading customers to start using it would need some manpower.

Receiver Requirements

The customers need to commit on building the user base. Once the discussion starts flowing and a critical mass of users is reached, the community should be able to show its value and therefore keep the users coming back.

5.1.2 Expert Pool

As an addition to the user community portal proposed above, the company could utilise the expertise of the end users for delivering consultation services to the customers. In Section 3.4.2 was mentioned that the customers would like to collaborate more with each other and the case company. Also the customers expressed their concern on the case company not having the competence to provide clinical support for the customers. The customers thought that instead of the company, the customers themselves possess the best knowledge of the field. But they do see the company as capable to manage the clinical support. Based on these insights, the end users could be interested to join a crowd working platform similar to the one introduced in Section 4.2.1.

As mentioned in Section 3.2, the case company already delivers consultation to the customer prospects during their planning of business case, processes, resourcing etc. Also the company helps in integrating the system to the customers' infrastructure and delivers training. Just like the training, and to some extent the integration, is already partially delivered to the new customers by the staff of existing customers, the same could be done also in prospect phase. The current pool of end users, used to deliver mainly training, would not have enough of variety of competences to deliver even the consultation listed above, not to mention all the other types of competences the customers could be looking for. An expert pool, that would be open for anyone to join, would be able to meet larger variety of customer needs.

Offering

The customer need analysis of Sections 3.4.1 and 3.4.2 does not go into the details of consultation needs, but the benchmarking of Section 3.3.2 gives some base for imaging what type of services the pool could offer. Therefore at this point, the offering is just a list of benchmarked offering which is used to initiate discussion in the brainstorming sessions. The pool could offer e.g. training and consultation to choosing correct equipment to acquire, business case planning, project management, site planning, system integration, patient workflow planning, analysis method planning, using and acquiring peripherals, and marketing. The services could be delivered to the customer either remotely or by travelling on-site.

No matter what the exact services would be, the fundamental goal would be to offer the customers an access to high quality expertise from wide variety of backgrounds, cultures, and competence. For the experts, the pool would offer possibilities to build their professional networks, promote their personal expertise, and benchmark

organisations which they do not meet in their ordinary day-to-day work. All this would give the experts an edge in the job markets. As the target customer segment is pretty small, it is hard to imagine any of the experts to reach remarkable financial benefit through the pool itself.

Funding Mechanism

As the company managing the service would need to take part to each project, the company would reach better understanding of the customers' challenges, organisations, processes etc. This information could help the company to innovate products and services that would better meet the requirements of the customers and therefore create extra income for the company.

Building that understanding and exploiting it in new products and services would take lots of time, though. Until that development would start turning into additional revenue, the funding of the pool would be relying purely on the revenue coming from the customers of the pool.

Provider Requirements

Like in the example service in Section 4.2.1, the company managing the service needs to market the pool, develop and maintain the website, build up and maintain a global network of experts, and maintain the quality of service. In the example service, competence management of the experts seems a little weak, but the issue could be solved by actively mapping the customer needs and building e.g. a peer review system that would indicate the level of competence of each expert.

The requirements for the experts are also like in the example service: good collaboration skills and flexible employer that allows the experts to conduct projects of their personal interest. Naturally the experts also need to be able to meet the customer expectations toward the experts' core competences.

Receiver Requirements

The requirements for the customer receiving the services of both the service provider and the experts are similar to the requirements of any consultation/outsourcing project. This area is discussed more thoroughly in the brainstorming sessions.

5.1.3 Analysis as a Service

As pointed out in Section 3.4.1, the main concerns of the customers are related to the usability and operating expenses of the system. The usability issues point especially to the analysis part of the workflow which also takes significant amount of time, and thus affects the staff expenses and limits the patient handling capacity. By allowing a service provider to remotely (over the Internet) analyse the acquired data, the customer could outsource the data analysis. This service idea is based on telemedicine described in Section 4.2.2, but it is now refined as *analysis as a service (AaaS)*. AaaS is described in more detail below by utilising the service elements introduced in Section 4.1.

Offering

AaaS would help in the customers' staffing challenges and increase their patient handling capacity. In theory the service could be running 24 hours a day which would significantly speed up the analysis compared to the current state.

Funding Mechanism

As the analysis software itself would stay as it is, its usability issues would not get solved, but by focusing on the limited types of patients, the service provider would have good possibility to reach for economies of scale. Economies of scale would help in strengthening the required competences, streamlining the workflow, and collecting data required to develop the software. The software development could even result in a CAD application, which is compared to AaaS in Section 5.1.4.

Provider Requirements

The service provider would need to solve some initial challenges. The challenges are at least how to technically accomplish a remote access to the data, how to address the data security concerns and medical regulation, and how to get staff with the required competences. One possibility for fulfilling the staff requirements would be to exploit the *user community* (Section 5.1.1) and/or the *pool of experts* (Section 5.1.2).

Receiver Requirements

For the customer, the main challenges are in the internal processes and regulatory matters. The customer needs to change its patient handling process so that the in-house analysis is replaced with remote analysis that is done by persons not employed by the customer's organisation. The preparation and data recording (the customer's

part of the patient workflow) needs to be highly standardised, in order to enable the service provider to use the same analysis workflow for all customers. Also the regulatory department need to be convinced on the patient data security and the ICT department needs to enable data access for the service provider.

5.1.4 Computer Aided Diagnosis

In the form described in Section 5.1.3, AaaS would be delivered as highly labour intensive service, with minimal changes needed to the current analysis software. To increase the usability, decrease the labour expenses, and further speed up the delivery of the service, Computer Aided Diagnosis (CAD) would be a natural step to further develop the service type. Next CAD is introduced as the next generation of AaaS and therefore the service elements are used to compare these two service generations. Unlike in the CAD service example of Section 4.2.4, this comparison takes into account both the on-line or installed application options.

Offering

Compared to AaaS, the basic offering of CAD is practically the same, although CAD does have some advantages compared to AaaS. First of all, as CAD would streamline the analysis and give the possibility for even faster analysis than AaaS, which would increase the customer's patient handling capacity. The second advantage would be caused by the possibility for the service provider to offer the service at lower cost compared to AaaS. As the third advantage of CAD, it could be installed in the customer premises as well, which would release the customer from the data security and medical regulatory challenges of AaaS.

As a setback of CAD compared to AaaS, CAD application would be even less flexible than a person providing AaaS. This means that each different type of analysis would need its own CAD application or at least different software settings.

Funding Mechanism

As already mentioned, CAD would mean significant savings for the service provider in comparison to AaaS. Outside of developing and maintaining the application, the savings would be possible due to the automated functionality not requiring user interaction.

Provider Requirements

Compared to AaaS, the CAD service provider needs highly skilled software development team. Also in the case of offering CAD as an on-line service, the provider needs to make large investments in ICT sector, in order to keep the service quality on the level agreed with the customers. Compared to AaaS, in CAD, the analysis workflow needs to be even more standardised.

Receiver Requirements

Like the provider part of the patient workflow needs to more standardised than in AaaS, so does the customer's part.

5.1.5 Online Data Pool

As the last preliminary service idea, this study proposes an *online data pool*, which the customers could use to store and share data they have acquired with the systems provided by the company. Although in the study analysed in Section 3.4.2, the customers had major concerns towards the data security of such service, the example service of Section 4.2.5 shows that the security challenges can be overcome. On the other hand, all the customers did not quite see the need for the service either, but as the examples of the consultation company in Section 3.3.2 and the CAD service in Section 4.2.4 show, having a pool of reference data can be useful both in research and clinical use. Next the data pool idea is described by utilising the service elements introduced in Section 4.1.

Offering

The offering element is left for the brainstorming sessions, as the researcher of this study does not have the level of clinical and/or research knowledge required for imaging how the customers could exploit the data.

Funding Mechanism

If the company utilised the data of the pool for its other development tasks (e.g. CAD software), it could use the revenue of future sales to compensate the costs of the data pool service. It is too early to evaluate whether the customers would be willing to pay for the service, without knowing the offering and value of the service for the customers.

Provider Requirements

No matter what the customers would use the service for, the basic requirements will be the same as in the example service of Section 4.2.5. The service provider must have

good understanding of the medical regulation, and they need to be able to prove that they fulfil the requirements. Like in any ICT service, the provider needs the resources to acquire, maintain, and develop their ICT infrastructure, in order to make sure the service can manage the highly varying load created by the end users.

Receiver Requirements

One basic requirement is that this type of service will need high bandwidth also in the customer end and a network route from the customer's data servers to the Internet. Additionally, like in Section 5.1.3, the customer has to meet the regulatory and data privacy requirements. At this point, without knowing what the pool would be used for, it is too early to further evaluate the requirements towards the customers.

The service ideas of the preliminary proposal are 1) *user community portal*, 2) *expert pool*, 3) *analysis as a service*, 4) *computer aided diagnosis*, and 5) *online data pool*. Next sub-section summarises the preliminary proposal.

5.2 Preliminary Proposal

The preliminary proposal of the study consists of five service ideas which are *user community portal*, *expert pool*, *analysis as a service*, *computer aided diagnosis*, and *data pool*. Each of the services has been described by utilising the service elements introduced in Section 4.1. Table 8 below summarises the service ideas and their elements. All cells of the table did not get filled yet and they have been marked as undefined.

Next, the proposal is tested during brainstorming sessions held together with few customers of the case company. The interviews have three objectives: to test the proposed service ideas, look for additional ideas in order to fill in the empty cells and possibly create completely new service ideas, and to find out whether some of the service types simply do not feel tempting for the customers.

Table 8. Preliminary Services Proposal

Service	User Community Portal	Expert Pool	AaaS	CAD (in comparison to AaaS)	Data Pool
Offering	Increased efficiency through collaboration	Customers: access to high quality expertise Experts: build and promote competence	Lower staff requirements, increased patient handling capacity	Increased patient handling capacity, lower costs, no data security and regulatory challenges	Undefined
Funding	Through increased product sales	Charge the customer	Economies of scale	No staff	Future earnings?
Provider Requirements	ICT admin and a community manager	Pool owner: ICT admin, pool manager, project managers Experts: collaboration skills, flexible employer, core competences	Meet the technical, security and regulatory challenges. High number of skilled staff. Standardise the patient workflow.	High R&D resources, stricter standardisation, less security and regulatory challenges.	ICT infrastructure and administration, regulation, and privacy.
Receiver Requirements	Commitment in the building phase	Undefined	Develop the processes, follow standards of the provider, regulation, data security	Stricter standardisation, less security and regulatory challenges.	Internet access from the customers data servers, regulation, privacy

6 Finalising the Proposal

Next, this section reports the received feedback towards the preliminary proposal of the study. After that, Section 6.2. reports the additional service ideas that the interviewed customers proposed during the brainstorming sessions. Then in Section 6.3, the insights of the brainstorming sessions are used as input to modify the preliminary proposal into the final proposal of the study. Finally, Section 6.4 reports the feedback got from the management of the case company when the final proposal was evaluated by them.

6.1 Received Feedback towards the Preliminary Proposal

The preliminary proposal was used as the basis of brainstorming sessions executed with four customer organisations of the case company. As described in Section 2.2, Customers A and B had only one interviewee present whereas Customers C and D had two interviewees. In this sub-section, term *customer* refers to all the interviewees of a customer organisation whereas term *interviewee* refers to the individuals joining the brainstorming sessions. Next, the feedback got from the interviewees on each of the proposed service ideas will be reported. The structure of this sub-section is again the same as in Sections 4.2 and 5.1, meaning that the feedback has been structured under the service elements introduced in Section 4.1 as well.

6.1.1 User Community Portal

Most of the interviewees liked the idea of building (or extending an existing) a *user community portal* that would combine the knowledge of all the existing discussion boards. In general, the portal was seen as a useful method to discuss best practices, share knowledge and recommendations on peripheral devices, professional networking, and developing usage procedures. Also the portal was seen as way for the case company to discuss with its customers in larger scale.

In addition to a normal discussion forum, the portal should also contain a knowledge base. Before launching this service, some knowledge base articles should be built based on existing knowledge, gathered from various sources like the official user's manuals, other discussion forums, and knowledge bases that the customers have built by themselves in order to streamline the work in their own labs. Once the portal would be launched, the knowledge base should be actively maintained in order to keep the content up-to-date and relevant to the users.

Customers A, B, and C saw the portal as a method to combine the knowledge of both clinical and research users. Customer D, though, stated that the clinicians are not interested and resourced to interact with the researchers.

Offering

The interviewees saw the main advantage of this service in easier access to existing knowledge without the need to know the persons behind the knowledge. The interviewees saw these advantages to be especially valuable for new customers that have limited experience of the technology, but also the most experienced interviewees saw this type of community to be useful for them.

Funding Mechanism

The interviewees thought that this service would be mainly funded by the service provider. Customer C saw some small chances in getting a European research or industrial funding for the portal. Customer D also thought that access to the knowledge base could be chargeable and that the clinical customers could be willing to pay for it.

Provider Requirements

Based on the interviewees, the service provider would need to make sure that the content of the knowledge base gets properly reviewed before releasing. Also the content must be structured and organized, so that the relevant information is easy to find. The persons doing these tasks, needs a good understanding of the technology and of the specific area of each article. For example a researcher is not the correct person to review a how-to article on executing a clinical epilepsy experiment. The building phase would require going through the customer base and persuading them to give their existing knowledge base content to the community.

The interviewees were even able to propose possible solutions for meeting the requirements. First of all, they all saw synergy with the offering of expert pool, as the service provider could hire the experts of the pool to create and maintain content of the knowledge base. Another option, proposed by Customer C, would be to hire a post Doc level student to build and maintain the knowledge base.

Receiver Requirements

The interviewees did not find much of requirements towards the customer of this service. The users would need a basic level of knowledge on the technology and willingness to contribute and give feedback for the content of the portal.

6.1.2 Expert Pool

All the interviewees were interested in the idea of an *expert pool*, and they all could already imagine themselves as part of the pool. The experts should be classified based on their key competences, so that it would be easy for the service receiver to find e.g. the best possible expertise in building a lab to help increasing the quality of the receiver's epilepsy treatment program. Customer D pointed out that expertise offering should start all the way from the lab technician level. Customer D also proposed an option that the pool would only list the experts and their competences but leave the expert selection, negotiation, and payment handling for the service receiver. In this scenario the service provider would be responsible only for the ICT of the service.

Based on the interviewees, expert pool seems to have good possibilities for synergy with the other services proposed. The interviewees of Customer C thought that the knowledge of the customer portal would mainly answer the questions related to some single action or peripheral, but the expert pool would be the choice when the customer would be in need for consultation in a longer term, like in a project. Additionally, as mentioned above, the experts could be used as resources needed for the customer portal content management, and Customer C even proposed to use the experts to help in reviewing and translating the user manuals of the case company. Customer D also proposed a coaching service (see Section 6.2.3) that would possibly utilise the experts of the pool.

Offering

For receivers of this service, the main offering would be an easy access to the best knowledge available in the field, without the need to first build a professional network to find the correct experts. That was seen as a major advantage in helping a new customer getting its new lab started up. The case company does not have data available on how long it normally takes for a new customer to get its operations fluent, but Customer D mentioned that it usually takes at least two years, which correlates well with the researcher's personal experience.

The interviewees agreed with the offering of the service for the experts as described in the preliminary proposal. The experts would benefit through learning more and building professional networks. Delivering the services was not seen as a source of substantial income source although Customer D already saw this as a possibility to compensate the expenses of the lab.

Funding Mechanism

The responses to the funding element of the expert pool varied substantially between the interviewed customers. The responses seem to correlate with the background of the customers, and the more research oriented the customers are, the more negative they are towards the idea of charging the service receiver for the service. This is evident from what Customer A said about charging for this type of service, that it would be against the current culture of the field. Still Customer D saw the clinical customers to be easily willing to pay for such service. Customer A also pointed out that when the service is paid for, the service provider becomes also responsible for the quality of the service. Customer C mentioned that the expert pool could be offered as an extension to the maintenance contracts of the case company.

Provider Requirements

As in the preliminary proposal, the service provider would have to make sure, the service delivered would meet the requirements of the service receiver, and therefore build and maintain the image of the service. To achieve this, the key point is to select the correct experts that possess the competences required by the service receiver. Customers C and D pointed out also that the service provider should train the experts, at least in teaching methods and the technology of the systems provided by the case company. Customer B saw that the scope of the service should be very clearly defined in advance.

The requirements for the experts were considered similar to the requirements in the preliminary proposal. The experts would need to agree on their information to be posted online, they would need to have the required competences, and they would need to speak the same professional language as the service receiver. As was mentioned before, the clinicians are not interested in the physicists' point of view. Researchers would be able to use their primary working time to deliver the service, if they could claim it as research collaboration. If the service would be provided by a clinician or to a clinician, all of the interviewees would need to take a time off from their primary job, which means that they would also need to get paid for it.

Receiver Requirements

The receiver requirements of this service idea were seen as pretty low. The service receiver would need to be able to clearly define the scope and competence

requirements of the project, ability to collaborate with the service deliverer(s), and willingness to rate and give feedback of the delivered service.

6.1.3 Analysis as a Service

All the interviewees saw AaaS as a useful service. The provided service could range from a very limited offering, such as data quality review, to pre-processing of the data, to epilepsy spike detection, and all the way to a complete analysis of the patient recording and supplying an experiment report to the referring physician. On the other hand, the service could be used as a remote training, as proposed by Customer A. Customer B also mentioned the touchpoint with training by saying that "the basic training offered by the case company on using their software is by no means sufficient to get clinical groups going on the road of analysis".

Offering

The offering was considered as similar to the offering in the preliminary proposal. The customer would require less staff and expertise, which would result in a faster start-up of new labs and higher patient throughput.

Funding Mechanism

The interviewees also agreed with the funding mechanism of the preliminary proposal. The customer should pay per analysis, or possibly a package of analyses, and in longer term the service provider could reach profitability through economies of scope, which would help in developing e.g. a CAD application (see 6.1.4).

Provider Requirements

The interviewees saw the main challenge of this service in finding the correct staff to perform the analysis. Especially if the service would be offered to clinical purposes, the regulatory and data security issues would need extra focus. All the interviewees agreed with the need for strict definition of all the steps, done both by the service receiver and the service provider, as for the experiment workflow.

Receiver Requirements

The requirements for the service receiver were seen to consist of accepting and following the strict workflow definition and dealing the regulatory issues.

6.1.4 Computer Aided Diagnosis

The basic message of the interviewees was that this kind of functionality should already be part of the analysis software package provided as part of the systems of the case company. Utilising the idea of CAD could be started from basic tasks like automatic and more robust pre-processing of data which was seen as technically feasible as some open source applications already have these features. This type of functionality was seen as a must in making the technology truly clinical. As this idea as a service was clearly rejected by the interviewees, it is not necessary to go through the feedback for the service elements.

6.1.5 Online Data Pool

Online Data Pool was seen useful by most of the interviewees. Customer B was unsure whether the regulatory would allow even research data to be shared. Customer B also thought that in general the researchers in the field do not want to share their data.

Offering

As was expected, the variety in what the pool could be used for was large. Customer A would have use for this kind of service in making the data available for its visiting researchers and, like Customer C, in simplifying both research and clinical multicenter studies. Customer C also saw the need for a multimodality database, meaning that the pool should contain data from various types of medical imaging and monitoring devices. Customer D also saw the main usage in building a pool of training data that could be used independently by the customers.

Funding Mechanism

The funding mechanism received different responses from the interviewees. Customer A mentioned only that this service should not cost any more than Dropbox and other consumer level cloud storage services. Customer B thought the service provider should do the investment and charge the customers for the usage. Customer C thought that this type of service could be eligible for public funding as well, if it was offered in collaboration with an institute. The training data pool, proposed by Customer D, should be sold as part of the system sales.

Provider Requirements

Like in the preliminary proposal, Customers A, B, and C were mostly concerned in meeting the ICT requirements of the service. Customer C even had some knowledge

on what kind of challenges the multimodality pool proposed by them would meet. From Customer D's point of view, building a training data pool would mainly require careful selection of data, providing all the necessary background information (like example subjects' clinical history), and defining the correct analysis results of each data set.

Receiver Requirements

The customers could not find anything to add to the preliminary proposal. Instead, they agreed with the preliminary proposal in that the service receiver needs to meet the technical and regulatory requirements.

6.1.6 Summary of the Feedback

In general, the interviewees were very interested in and positive towards the proposed services. Only the idea of offering *computer aided diagnosis* as a service did not get much of positive reactions. Due to the negative feedback, CAD service is left out from the final proposal. Even without any hinting by the researcher of the study, the interviewees saw the synergy possibilities between the proposed services. Some of the synergy ideas went even further than what the researcher had thought of. Customers A, B, and C were well in line with the opinions of each other, but Customer D had a clearly different point of view to the proposal. The message of Customer D must be taken seriously, as the customer best resembles the target customer profile of the proposal.

The customer feedback reported above is used in Section 6.3 to modify the preliminary proposal into the final proposal. The next sub-section reports new service ideas proposed by the interviewees.

6.2 Service Ideas Proposed by the Interviewees

In addition to discussing the preliminary proposal, the interviewees were requested to propose their own service ideas. Three out of the four customers proposed new service ideas which were regular user meetings, coaching, and allowing the customers to access the case company's issue tracking tool. Next these three service ideas are introduced using the service elements introduced in Section 4.1.

6.2.1 Access to Issue Tracking Tool

Already before the actual interview, while discussing latest news of Customer A, the interviewee proposed that the customers should have an access to the Issue Tracking Tool and technical knowledge base of the case company. Issue Tracking Tool (ITT)

means an application where the customer service personnel of a company records support requests of the customers. Once the support request has been solved, the resolution is then recorded into the tool and the issue gets closed. At the case company, this ITT functionality has been built into their Customer Relationship Management (CRM) application. This CRM application is maintained by the mother corporation of the company, and it additionally contains a knowledge base functionality that is used to e.g. share instructions on how to solve the most frequent technical issues the Field Service Engineers are facing. What is even better for this service idea is that the corporation is already developing a customer interface to the CRM application. The customer interface would allow submitting issues directly into the system, without the requirement to send an email or to call to a company representative, follow up the issues and add information to them, and access a customer oriented version of the technical knowledge base.

Offering

The interviewee saw this service as a possibility to resolve their issues faster and more efficiently compared to the current state. The interviewee thought that currently the information between the customers and the case company does not move as fast as possible, and that the customer does not receive all the relevant information. By accessing a knowledge base, the interviewee thought the customers to be able to solve some of the issues by themselves.

Funding Mechanism

The case company would save in its maintenance costs and through faster resolutions increase the customer satisfaction.

For the provider and receiver requirements the interviewee did not have any input.

6.2.2 Regular User Meetings

The interviewees of Customer C proposed the case company to start having regular customer meetings with the goal to get a large number of customers to the same place at the same time. The event could be organised together with a different customer each time, and possibly also rolling between the four main geographical market segments (Europe, Asia and Pacific, Japan, and North America). More experienced users would be invited to present in the event, and the attendees would be asked to propose topics for the presentations, possibly through the user portal. The customer

also told that the two deceased competitors of the case company had been organising this type of regular events for their customers.

Offering

Basically the offering of the meetings would be the move from the digital user community to meeting the community members in person. This would give the users the possibility to learn to know each other in person, share knowledge, argue on best practices etc.

Funding Mechanism

The interviewees did not have any other idea for the funding but the case company to take care of the expenses. The meetings would give the company the possibility to invite its prospective customers to learn to know the existing customers and to ask for their opinions and advices.

Provider Requirements

The main requirement would be the competences required to organise such events in collaboration between the case company and the organizing customer. They would need to arrange a venue for the meeting and presentations, accommodation, program etc.

Receiver Requirements

The travelling expenses would be left for the attendees, possibly excluding the prospective customers invited by the case company. Some of the attendees would also be required to present in the event.

6.2.3 Coaching

The proposal of the interviewees of Customer D was to start offering coaching for the new customers. The service provider would propose a coach, which would help the customer to start-up its new lab and support the customer in meeting the challenge of the steep learning curve. The coach would be selected so, that the coach would have the expertise the customer is reaching for. For example, if the customer would be trying to improve the quality of its epilepsy treatment process, the coach would be selected among the people having expertise in using the system in epilepsy diagnosis. Interviewee A compared the distinction of AaaS and coaching services to the phrase of “providing fish vs. teaching how to fish”.

Offering

This service would help the customer in getting the lab up to speed faster and reaching high quality and efficiency, without the need to find the correct people by itself.

Funding Mechanism

This service would be purely funded by charging the customers. The interviewees thought that hospitals would be willing to pay for this service, as they are not willing to spend many years to see in reality what the system can give for them.

Provider Requirements

For the service provider, the key factor would be finding the correct coach meeting the needs of the customer. The service provider would also need to take care that the coaches have the competences required in coaching.

Receiver Requirements

The interviewees were not able to define any requirements toward the customers of this service.

6.2.4 Summary of the Interviewees' Ideas

All three service ideas proposed by the interviewees add value to the study as, just like the ideas in the preliminary proposal, they could be services that answer the research question of the study: What kind of services could accelerate adoption of the case company's product by clinical customers?

The service ideas of the interviewees also have synergy with the preliminary ideas of the study and ongoing development in the company. As already mentioned, the mother corporation of the company is already working on providing the customers an access to the CRM. Allowing the customers to access the knowledge base of the CRM, would partially cover the needs towards the knowledge base of the proposed customer portal. The regular user meetings would also support building the customer community and expert pool. The coaching service, on the other hand, would need experts to deliver it, meaning that coaching fits well as a pragmatic example of a service provided through the expert pool. On the other hand, all of the services proposed above could also be added independently to the current offering of the case company and the company could start offering all of them with minimal investments. Due to these advantages, all three new service ideas are added to the final proposal of the study. Next the final proposal is described in detail.

6.3 Final Proposal

The final proposal of service ideas is built on the basis of the preliminary proposal. The preliminary proposal was modified based on the feedback received during the customer interviews (Data 2). It is not realistic to expect the case company to start offering all the services. Therefore, although many of the proposed services have synergy possibilities with each other, the services are not bundled with each other. Most of the preliminary ideas have not been modified much, but the idea of offering *computer aided design* as a service is removed from the final proposal, and *online data pool* has been refined into *training data pool*. In addition to the services left from the preliminary proposal, the final proposal contains also the three new services proposed by the customers (see Section 6.2).

The service ideas of the final proposal are 1) *user community portal*, 2) *regular customer meetings*, 3) *expert pool*, 4) *coaching*, 5) *analysis as a service*, 6) *training data pool*, and 7) *customer access to CRM tool*. Next each of the ideas is described in detail, using the service elements introduced in Section 4.1. Again, the study does not state who would be the service provider.

6.3.1 User Community Portal

The first proposed service is a modern user community web site that would contain a traditional discussion board and an actively maintained knowledge base section. The community, and especially the knowledge base, should be targeted to clinical users, and the clinical focus should be taken into account when creating content into the knowledge base. The user community and the content of the knowledge base would not need to be built from scratch, as the customers and existing communities already possess most of the required information and the case company could just support some of the existing communities to develop their web site more professional.

Offering

This service would give the customers a centralised access to best possible knowledge in the field. It would give the customers the possibility to discuss the best practices with each other, and through the knowledge base they would find answers to most frequent issues they are facing. All this would help new customers with the steep learning curve they are facing when starting working with the technology. Therefore the reputation of the technology among prospective clinical customers would improve, which would result in increased system sales.

Funding Mechanism

At least the discussion board should be free of charge for the users, but in the long run the service provider could think of charging for access to the knowledge base. A partial public funding could also be possible to reach. Still, this service would be mainly funded through income of other offerings of the company.

Provider Requirements

In addition to the ICT requirements, the service provider would be responsible for the quality of the content, especially in the knowledge base. For managing the content, the service provider would need dedicated personnel, with the competence required to create content for users with no prior experience in the technology and without technology or physics education. Particular focus would be on using the language of medical doctors and hospital administration. An important factor is that when the portal would be launched, it should already have such content that the clinical customers would immediately see it valuable for them.

Receiver Requirements

The requirements towards the customers of the service would be minimal. In order to keep the community active, the customers would need to collaborate with each other, which would create additional value for them. The customers would need to review, rate, and give feedback on the content in order to maintain and develop its quality.

6.3.2 Regular User Meetings

As proposed by Customer C (see Section 6.2.2), a useful addition or option to the user community would be regular meetings for the customers of the case of company. The meetings would be held only for the current and prospective customers of the case company. Although the user community described above would not require the customers to personally know the experts, in longer term any kind of ICT solution cannot replace the need for professional networking and knowing the people behind their digital identity. By providing the customers the means to get to know with each other and to share their ideas face to face, all parties would win. The events could be held e.g. at a yearly basis, and hosted by a different customer every time, but the main provider of this service would be the case company.

Offering

The meetings would give the current and prospective customers great means for building their professional networks and learn more.

Funding Mechanism

The events would help in tying the customers to the case company and create a great possibility for thorough discussion between the customers and the company. By inviting prospective customers to the meetings, the customers would receive first hand information from more experienced users. Still, this service would be funded through income of other offering of the company.

Provider Requirements

The case company would need to organise the venue, accommodation, and program. Part of the work would be done in collaboration with the hosting customer. The community portal could be used to query popular presentation and discussion topics.

Receiver Requirements

The customers joining the meetings would need to pay for their travels, and some of them would need to present to the others.

6.3.3 Expert Pool

The third service of the proposal is an expert pool like the example service of Section 4.2.1. The pool would consist of individuals from the field, who could be browsed through a web site. The expertise of each expert would be visible on the web site. The customers could use the web site to request for consultation for their projects, and the service provider would then select which experts to recommend for the customer. The goal of the projects could be anything where the experts could help, ranging e.g. from defining the correct equipment to acquire, to learning how to streamline an epilepsy treatment process. One possibility for a service offered by this the expert pool is coaching, which is described in Section 6.3.4.

Offering

The benefit for the customers is clear: by using the consultation offered by the best experts in the field, the customers would reach their goals faster and with fewer resources, when compared to the current state.

For the experts, delivering this service would give possibility for additional income, professional networking, and learning more, both from the various customers they would be helping and the possible other experts joining the same projects.

Funding Mechanism

Based on the customer interviews, especially the clinical customers would be ready to pay for this service, but it could work also in the research field. By being part of the projects, the case company would also get the possibility to learn more from the customer processes, which would help it building its offering to better meet the customer needs. Main funding mechanism would be charging the customers.

Provider Requirements

The service provider would need to carefully select the correct experts based on the background and needs of the customer. The experts would also need to be trained to have the same basic knowledge of the field and to teaching and collaboration skills.

Receiver Requirements

The service receiver would need to be able to clearly define the scope and competence requirements of the project, ability to collaborate with the experts, and willingness to rate and give feedback of the delivered service and the experts.

6.3.4 Coaching

As proposed by Customer D (see Section 6.2.3), a useful addition to the proposal would be offering coaching for the customers of the case of company. The coaching would be done by an experienced user that would have expertise in the particular process or application the customer would be trying to learn. The coaches would range from lab technicians, to physicists, and all the way to medical doctors and possibly even hospital administration. This service can be seen as an example of what type of consultation the expert pool could provide, but this would work out also as an independent service.

Offering

A new lab would get up to speed significantly faster compared to the current state, if the customer would get a dedicated coach that would support the customers in starting up its lab and learning how to do all the system usage steps required to get correct results from the studies the customer is aiming at.

Funding Mechanism

The funding of this service would rely purely on charging the customers.

Provider Requirements

Like in Expert Pool, the key challenge of this service would be the selection of the coach. The coach would have to have exactly the kind of expertise the customer needs. As the customers would be inexperienced in the field, they could be easily misled from their objective, if the coach would not be fully focused on the same objective.

Receiver Requirements

The requirements for the customer would be the same as for the expert pool: clearly define the objective, ability to collaborate with the coach, and willingness to rate and give feedback of the delivered service.

6.3.5 Analysis as a Service

The fifth service type proposed by this study is *analysis as a service* (AaaS). AaaS would give the customers the possibility to outsource parts of their data analysis process. The provided service could range from a very limited offering, such as data quality review, to pre-processing of the data, to epilepsy spike detection, and all the way to a complete analysis of the patient recording and supplying an experiment report to the referring physician. In the launching phase, the service should focus only on one part, e.g. the data pre-processing, of the whole analysis process. The service would be delivered by utilising remote desktop sharing over the Internet, which would also give the possibility to offer remote training or coaching.

Offering

AaaS would help in the customers' staffing challenges and increase their patient handling capacity. Also the start-up of new customers would speed up significantly. In theory, the service could be running 24 hours a day, which would further speed up the analysis compared to the current state, where usually a single person analyses all the patients of a customer.

Funding Mechanism

This service would be purely funded through charging the customers. By reaching economies of scale, the service provider would be able to make the service profitable.

Provider Requirements

The main challenge in providing this service would be getting the staff to deliver it. The competence requirements are rather high as the required education would be on the level of postgraduate or postdoc in physics or medical doctor. To get that level staff, the service provider would need to collaborate with the existing customers of the case company, possibly by utilising the community portal or expert pool.

The service provider would also need to define strict guidelines for the whole patient workflow, including both the actions performed by the service receiver and the service provider. The actions of each case would need to be so well documented, that the service receiver would be able to afterwards review all actions done during the process of a single patient.

Receiver Requirements

The service receiver would need to enable remote access to its analysis workstation and patient data. That would require collaboration with the ICT and regulatory departments of the service receiver's organisation. In addition to that, the service receiver would need to agree to follow the strict guidelines defined by the service provider. The final signing of the patient report would be left for the service receiver.

6.3.6 Training Data Pool

The preliminary idea of an online data pool did not have a definition for its offering, and even the customers interviewed for Data 2 could not offer a common view on what the pool could be used for. Therefore the clear idea of creating a pool for training data, proposed by Customer D, is taken as the final proposal of this service type. After starting with the training data pool service, the service provider could think of expanding the offering to other data pool services.

Currently, the new users receive some example data from the trainers during their training period, but after that the customers do not have other option than to start recording real patients with their system. Then they compare the results they receive through data analysis, with the results received by other modalities. The problem in this method is, that the other modalities are not fully comparable with the results got from the data recorded with the systems of the case company, and therefore it is hard to tell which of the results are correct. This means that it takes a long time before the new users become confident with the results they get.

The training data pool would contain test subject data, which the trainees could use independently from the training offered by the case company. In addition to the raw data, the pool would also contain all the clinical background information required in diagnosis, and also the expected results. In order for the trainees to be able to see what the subjects would look like when using other modalities, the data pool should contain also the results of the same subjects using these other modalities. The trainee would then analyse the data, make a diagnosis based on the analysis, and then compare the results with the expected results. The data in the pool would range from easy to hard cases. As the data files recorded with the system and other modalities are so large, the data pool would have to be either online or shipped to the trainees on a portable hard drive.

Offering

The customers would have the possibility to train on real data before starting to experiment with their own patients, which would help building their confidence. As they would be doing this training mainly independently, it would be significantly less expensive than actual training.

Funding Mechanism

This service would be chargeable to the customers. It could be charged as part of the system sales or per access period or amount of cases accessed.

Provider Requirements

The main challenges in providing this service would be in the technical side, as creating and maintaining a full scale multimodality database is not simple. Still in this case, there would be only few example cases, and after storing the data to the database, it would only be read, not altered, by the customers.

The data privacy and regulatory concerns would be significantly lower, if not negligible, than in a pool for real patient data. The service provider would only need to ask for the subjects' permission for sharing the data and make sure that all the data is anonymised and not traceable back to the subject.

Receiver Requirements

From the customers, this service would require only basic training to the analysis software of their choice.

6.3.7 Customer Access to CRM

As the last service, this study proposes allowing the customers to access the CRM Tool of the case company. This give the customers the possibility to submit customer support tickets, follow up support tickets, submit feedback after each ticket gets resolved, and access a technical knowledge base of the case company.

Offering

First of all, the customers could create new tickets outside of the office hours of the case company, which would speed up the process for the case company to start investigating the issue. By submitting additional information, requested by the case company, directly to the CRM, the ticket handling would speed up even more. Additionally, the customer would have better understanding on how the issue solving is progressing. By accessing the knowledge base, the customers would be able to solve some of the most frequent and simple issues by themselves without the need to wait for the case company to react on the issue. All this would speed up the issue solving and build trust towards the case company among the customers.

Funding Mechanism

Although the technical work required to enable the customer access would be funded by the case company or its mother corporation, in the long run the company would reach savings in customer support.

Provider Requirements

As the functionality already exists, launching it for the customers would not require major investments. It would require only some level of marketing and possibly customer training to get the customers using the access.

Receiver Requirements

From the customer side this would not require much. The users of the access would need only to learn how to use it.

6.3.8 Summary of the Final Proposal

The final proposal of the study consists of seven service ideas which are 1) *user community portal*, 2) *regular user meetings*, 3) *expert pool*, 4) *coaching*, 5) *analysis as a service*, 6) *training data pool*, and 7) *customer access to CRM*. Each of the services has been described by utilising the service elements introduced in Section 4.1. Table 9 below summarises the service ideas and their elements.

Table 9. Final Proposal.

Service	User Community Portal	Regular User Meetings	Expert Pool	Coaching	Analysis as a Service	Training Data Pool	Customer access to CRM Tool
Offering	Easy access to existing knowledge and the expertise of experienced users	Build professional networks, learn more	Get consultation from the best experts of the field i.e. experienced users	Faster start-up, reach the goals faster	Lower staff requirements, higher patient capacity	Training on own schedule, costs less than on-site training	Shorter issue resolution times
Funding	Other income of the service provider	Other income of the case company, learn from the customers, use for marketing	Charge the customers	Charge the customers	Charge the customers	Charge the customers	Other income of the case company, savings in customer support
Provider Requirements	Competence to manage content for inexperienced users, ICT	In collaboration with a hosting customer organise the event	Ability to get the correct experts for each case, train the experts, ensure service quality	Ability to get the correct coach for each case, train the coaches, ensure service quality	Very highly educated staff, strict guidelines for patient workflow	Competence to create a multimodality database	Negligible
Receiver Requirements	Collaboration	Pay for travels, some to present in the events	Well defined scope and requirements for the projects	Well defined scope and requirements for the projects	Solve ICT and regulatory issues, follow the guidelines set by the provider	Basic training on analysis	Negligible

Next, Section 6.4 reports the feedback gathered during the meeting where the final proposal was evaluated by the management of the case company.

6.4 Evaluation of the Final Proposal

The final proposal was taken to the case company to be evaluated by a selected group of managers of the company (Data 3). Next, the feedback received on each of the proposed ideas is reported. As the interviewees mainly agreed on the elements of the ideas, the focus of the reporting is on the disagreeing feedback. Therefore, this time the feedback is not structured under the service elements.

6.4.1 User Community Portal

The idea of creating a web portal for the users of the technology was considered interesting by the interviewees. The interviewees agreed on all but one of the service elements of the User Community Portal. What the interviewees did not quite like was the idea of offering the service for free. The interviewees proposed that the portal could be used to offer also official customer support by the employees of the case company and at least that part of the service would be chargeable. The interviewees also thought that if the service would be provided by the case company, it could help the company in building its brand. They also proposed that the experts of the Expert Pool could be used to review the content of the knowledge base.

6.4.2 Regular User Meetings

The idea of organising regular user meetings received mainly positive response. The main concern was the funding mechanism as the interviewees would not like to add any new non-profitable services to the offering of the company. During the discussion, it turned out that the case company already organised similar meetings more than a decade ago, but that they were discontinued due to the lack of customer interest, which created some concerns on whether the customers would be interested even now. Since then, the customer base of the company has more than tripled though, so this idea triggered some brainstorming. One additional idea proposed, was to utilise video conferencing technology to stream the presentations held in the meetings for those who would not be able to attend the meetings.

6.4.3 Expert Pool

The idea of building an expert pool received very positive response from the interviewees. They saw it as an answer to the problem of limited number of trainers

(see Section 3.2) that currently are mainly researchers, not clinicians. Also the fact that the service would be clearly chargeable to the customers was seen as a positive aspect compared to the first two ideas.

6.4.4 Coaching

Coaching as an example of what the expert pool could offer was taken very positively. The interviewees also agreed with the proposal in that coaching could be offered even without the expert pool.

6.4.5 Analysis as a Service

AaaS was considered an interesting service idea but the possible regulatory burden was seen as a challenge that the company is not currently ready to confront.

6.4.6 Training Data Pool

The interviewees thought that a training data pool should already be part of the training package of the company, and that investigations for creating it should be started. Some concern was raised again on how to make the service chargeable.

6.4.7 Customer access to CRM Tool

The interviewees agreed that as the corporation is already working on it, the case company should also start following the project, in order to evaluate if the access could address the needs of the customers. Again the idea of offering this service for free did not receive full support.

6.4.8 Summary of the evaluation feedback

The managers considered the ideas of the proposal interesting, and agreed on most of the service elements. Additionally, these interviewees, like the customers earlier, saw synergy possibilities between the services.

The interviewees had some challenges in thinking that some other party than the case company would provide any of the services. They also did not see any other way to clarify the value of the services, than the direct income the services might be able to create. The company would not like to start offering any new non-profitable services. Therefore it is hard to imagine the company choosing any of the proposed free of charge services.

The interviewees did agree on starting further investigation around the project, to enable the customer access to the CRM. The planned outcome of the project should be

evaluated in order to see whether it would meet the requirements of the customers of the case company.

7 Discussion and Conclusions

This final section of the Thesis first summarises the target and outcome of the study. After that it concludes some findings which the case company should take into account when considering the development of its service offering. Finally, the outcome, reliability and validity of the study are evaluated.

7.1 Summary

The target of this Thesis was to propose ideas for new services that would decrease the customers' barrier for acquiring the systems offered by the case company. The target customer type of the proposed services is a clinical customer organisation without previous user experience in the technology that the systems of the case company utilise. The study was conducted as a qualitative case study.

The study started by analysing the current state of the case company and its offering, the existing rivalling service offering, and the customer needs. The current state analysis revealed that, in its current form, the systems of the case company are too complicated and expensive to operate for the target customer type. As the current service offering of the case company contains only services that support the product (SSP), and the existing customers are rather pleased with the quality of these services, the study proposes services supporting the client's action in relation to the company's product (SSC).

After the current state analysis, the study built a conceptual framework, which was then used to generate a preliminary proposal containing five service ideas, which were based on the study of existing service offerings in medical devices and other small niche product businesses. These services were proposed to four existing customer organisations of the case company.

Based on the received feedback and three new service ideas proposed by the customers, the study finally proposes seven services be offered to the customers of the case company: 1) *user community portal*, 2) *regular user meetings*, 3) *expert pool*, 4) *coaching*, 5) *analysis as a service*, 6) *training data pool*, and 7) *customer access to CRM*.

7.2 Practical Implications

The final proposal was evaluated by the management of the case company. Based on the discussion, the company is going to further investigate the possibilities to implement one of the proposed services: *customer access to CRM*. Also *coaching* and *training data pool* seemed like services that the company could rapidly add to its offering.

Based on the current state analysis of the company, the company should carefully consider its steps before expanding their services offering. The case company is very product centric, and a large portion of its current service offering is not clear even for the company itself. The company does not realise some of its operations as services and therefore these services are seen only as expenses in their financial statements, although the services clearly are valuable to the customers. As Gebauer and Friedli (2005) are warning, this has lead to the situation where these services are not getting the attention they deserve. This leads back to the roots of the study: why should the case company provide these services? If it would collaborate with another party that would be more capable to provide the services, the company may lose profits from the services but its system sales could still increase, which was the initial goal of this study. All of the proposed services are still on the level of an idea, so before any party would be able to start providing them, they would still need to be properly designed as complete service concepts.

7.3 Evaluation

This sub-section evaluates how well the outcome of the study reaches its target and how valid and reliable the study is.

7.3.1 Target vs. Outcome

The target of this Thesis was to propose ideas for the new services that would decrease the customers' barrier for acquiring the systems offered by the case company. Based on the customer and company management interviews, the proposed services could very well achieve this target.

7.3.2 Validity and Reliability

The actions taken to ensure the validity of the study match with the validity reliability plan described in Section 2.3. The data collection was described in detail in Section 2.2 and all customer interview notes were sent back to the interviewees for verification. The notes of the interview of the company management for evaluating the final

proposal were not sent back for verification due to the large number of respondents and some time table concerns. Although the thought of not limiting the proposed ideas, by the current capabilities of the case company, was helpful, the researcher was still aware that the proposed services were, in the end, partially limited by these factors.

The reliability of the study was ensured by taking the actions described in Section 2.2. Data was collected from various sources using differing data collection methods at different points of time. The preliminary proposal was commented by four non-related customer organisations that all resided in different countries, and the final proposal was evaluated by four managers of the case company, all being responsible for different functions of the company.

Most parts of the current state analysis (Section 3) rely on single sources of data, though. This was inevitable as the section mainly analyses the case company, and that information is only available from the case company. As was mentioned in Section 2.2, only one of the four customers interviewed during data collection phase 2 had the exact same background as the target customer type of this study. By hearing more of that type of customers, the final proposal could meet their needs even better. The customer satisfaction survey (Data 1b) used as the data source of Section 3.4.1 had some issues that makes its results incomparable: 1) even the case company management does not know how the satisfaction percentages have been calculated and 2) due to some issues in conducting the survey, the company did not receive responses from any of the customers located in North America or United Kingdom (Data 1b). The second issue means that the survey is missing the responses of 1/3 of the customers, and as most of the clinical customers of the company are located in NA, this 1/3 contains most of the clinical customers.

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Customer interview 1 (Data 2a)



TOPIC: __Testing the Proposed Service Ideas__

Information about the informant (Interview 1)

Table 1

Name (code) of the informant	Person 1
Position in the organization	Project manager
Date of the interview	22.4.2014
Duration of the interview	10:10 – 13:50
Document	Field Notes

Field notes (Interview 1)

Table 2

	Themes of the interview	FIELD NOTES
0	Background	The system was bought to strengthen Swedish research in cognitive brain science. Clinical users were taken in afterwards to secure long term funding and to get a view to the whole process of epilepsy treatment

1-5	See next page	-
6	Other Service types?	- See table 4.

Table 3 Feedback of the Preliminary Proposal

Service	User Community	Expert Pool	AaaS	CAD (in comparison to AaaS)	Data Pool
Offering	For discussing about peripherals etc. Benchmark best products. Advises for free, without spending lots of time to look around the Internet. Forum, wiki, e.g. how to replace the helium membrane, comparing helium consumption	Customers: access to high quality expertise Experts: build and promote competence, finding ways to collaborate, not selling knowledge A grading system could be bad for current experts as they would start from the bottom	Would be useful Distinct between clinical service and education kind of thing Lower staff requirements, increased patient handling capacity, get the lab up to speed faster	Useful especially if the type of study would be needed seldom. Hard to imagine turning into reality: could start up as an automatic data quality check Increased patient handling capacity, lower costs, no data security and regulatory challenges	Having data available for future use, share data to external users, reach larger amount of test subjects
Funding	Strengthen the brand	Challenging: Charging for the service would be against the current culture Charging also creates responsibility Use the experts to build the wiki	Charge per analysis. Collaboration with existing customers, Economies of scale. Use the gathered knowledge for training.	Less interaction	Not ready to pay more than Dropbox
Provider Requirements	Review of what to share -> structured content. Not leave it for the users. So that there would be content at time of launching. Community manager.	Pool owner: Same as in community Experts: Agree with their info to be posted online. They have reserved time for research collaboration.	Where to find the staff? 50-50 analysis and research? Collaboration, and management, careful result inspection. The workflow should be standardized into a decision	Agree, careful result inspection	IT infrastructure and administration, regulation, and privacy. The data owner must decide who gets access. Keep it simple and low cost, though.

			tree: would give credibility		
Receiver Requirements	Feedback	Understand the problem to solve, willing collaborate and possibly share the results	Allow access to customer data, careful result inspection.	Follow the standardization, careful result inspection	Nothing to add

Table 4 Service Idea Proposed by the Customer

Service	Issue Tracking Tool
Offering	Possibility to follow up the issues Knowledge Base of common and customer fixable issues
Funding	Save in maintenance expenses
Provider Requirements	
Receiver Requirements	
Other things to consider	

Customer interview 2 (Data 2b)



TOPIC: __Testing the Proposed Service Ideas__

Information about the informant (Interview 1)

Table 1

Name (code) of the informant	Person A
Position in the organization	Laboratory Engineer
Date of the interview	5.2.2014
Duration of the interview	10:40 – 13:10
Document	Field Notes

Field notes (Interview 1)

Table 2

	Themes of the interview	FIELD NOTES
0	Background	- #1: Basic research in human neuroscienceæ #2: clinical evaluation in epilepsy
1-5	See next page	-
6	Other Service types?	- NA

Service	User Community	Expert Pool	AaaS	CAD (in comparison to AaaS)	Data Pool
Offering	<p>People with different backgrounds and interests would have possibility to interact. Learn more.</p> <p>HowTos, learning materials, discuss best practices, Kudos</p>	<p>Can see the value in purely clinical settings, not relevant in research. "Experts" should clearly define their relevant expertise, possibly refer to their "score" on the community site.</p>	<p>To be honest, I don't think the basic training offered by The case company on using their software is in any means sufficient to get clinical groups going on the road of analysis. It's not because of lack of qualified teachers: there are simply too many important decisions to be made on the way (head model, projections & filtering, inverse methodology /parameters,...): clinicians do not want to care about all that!</p> <p>Could work within a specific, limited scope (e.g., localization of epileptic spikes).</p>	<p>This is more a question of how the case company wants to devote development resources. If AaaS is offered and catches on, then maybe CAD can be a way to maximize profit and/or minimize effort.</p>	<p>Raw data storage</p> <p>Not sure about this. Would be tricky to get permission in DK due to ethical considerations. If the right level of encryption was in place, then maybe, but requires a great deal from the hospital network infrastructure too...</p>
Funding	<p>Public research funding for a global project hard to imagine.</p> <p>Future product sales.</p>	<p>Minimal costs for infrastructure (website).</p> <p>"Experts" need to obtain leave-of-absence from their positions, and thus be economically compensated (up front).</p>	<p>The case company up-front (customer in the long run).</p> <p>Consider supporting open-source tools development: paying a capable programmer or a small group 1-2 months of salary will get a project really, really far! It's called a code sprint and you'd be amazed what they can do. Most hard-core developers in the scientific community would</p>	<p>The case company up-front (customer in the long run).</p>	<p>The case company up-front (customer in the long run).</p>

			<i>love</i> to get the opportunity to devote themselves 18 hours a day to their “hobby”.		
Provider Requirements	Technology and administration. No community manager.	Very clearly documented scope (thematic and time-wise) of expert involvement. What can the receiver expect, and when? Members of “pool” might want to collaborate on finding a “red line” in teaching/training efforts. This could be part of the community-building (only those interested in such building are likely to offer their services, anyway).	Tools and infrastructure to perform the analysis (remote?).	Tools and infrastructure to perform the analysis.	Infra.
Receiver Requirements	Ready to share knowledge.	Accept the terms of the agreement/scope, give feedback on experiences.	Accept a standard	Accept a standard	
Other things to consider	See groups MNE group, Neuromeg, Brainstorm, MEG UK	Who’s responsible? What is the role of The case company in mediating the link to an “expert”? How can The case company ensure that all parties are comfortable with the relationship, and feel that it is within the agreed upon “specs”.	Data Security, how to validate? Could supply the results using multiple different parameter sets. In Epilepsy, analysis is a bottleneck. See MNE web based.	how to validate, technical challenges	Customers don’t like to share their data. Do the public funding organizations have their own data pools? Data is not allowed to use for another purpose without a specific permission from the patient/subject.

Customer interview 3 (Data 2c)



TOPIC: __Testing the Proposed Service Ideas__

Information about the informant (Interview 1)

Table 1

Details	
Name (code) of the informant	Persons A and B
Position in the organization	Current and previous lab managers
Date of the interview	6.5.2014
Duration of the interview	14:20 – 17:35
Document	Field Notes

Field notes (Interview 1)

Table 2

	Themes of the interview	FIELD NOTES
0	Background	- Started from research of neuroscience in general, adding epilepsy later. Clinical usage in aging, Parkinsons, and scitsofrenia

1	Proposed Services	- See next page
2	Other Service types?	- See Table 4

Table 3 Feedback of the Preliminary Proposal

Service	User Community	Expert Pool	AaaS	CAD (in comparison to AaaS)	Data Pool
Offering	<p>Access to expertise, sharing knowledge, knowing who is doing what, developing usage procedures, the company could keep the customer updated of the development projects, help in regulatory procedures of the customers.</p> <p>Would be a major advantage from the current disorganized state</p>	<p>Customers: If the community (single issue) is not enough (a project), then hire the experts. Help in using the system from more practical point of view. Experts of stimulation, BCI, Eye Tracking etc. Also technicians on how to run experiments etc. Statistical analysis of data. Try to get experts also from other fields (like EEG) -> multimodality approach</p> <p>Experts: building knowledge, experience, and networks</p>	<p>Speed up the process, lower staff requirements, FDA approved process, report statistical data of e.g. aging.</p>	<p>Make some parts of processing doable by the technicians.</p>	<p>Sharing data would be helpful for research, which would i</p> <p>Would be very helpful to build multicenter pool also for clinical studies. Completely fundamental.</p>
Funding	<p>Centralised access to user opinions and needs -> better understanding of the customers -> better products and services.</p> <p>Funded by the company but could look for public funding also.</p>	<p>Use the experts to review, translate etc new user documentation and community knowledge base.</p> <p>Charge the customers.</p> <p>Add it to the maintenance contract as an extension. With that funding pay the experts to visit the sites regularly.</p> <p>Pilot as free service.</p>	<p>Charging by patient, length of recording, type of processing. Find ways to make the processing more efficient, develop software.</p>	<p>Pre-processing should be part of the analysis software package. More advanced functions chargeable.</p> <p>Collaborate with the community and experts for the development.</p>	<p>Need large funding, but could well get public funding. Would need to be run in collaboration with an institute.</p>

<p>Provider Requirements</p>	<p>Manage the content, persuade users to join, build initial knowledge base from existing user documentation, hire e.g. a post doc student for the project, fund someone to run the community in order to avoid regulatory burden. The provider needs to review the information in the knowledge base.</p>	<p>Provider: The same manager as in the community could direct customers from the community to the expert pool. Keep the service live. Train the experts with the system specific details. More detailed system documentation for the experts. Experts: Time can be hard to get. Good knowledge of the system and the specific expertise.</p>	<p>Who would review the results? Create strict requirements on how to do the recording. The provider may need to train the customers to setup the settings and procedures.</p>	<p>High R&D resources, stricter standardisation, less security and regulatory challenges. The same as in AaaS.</p>	<p>Database management can be challenging. Need special large scale multimodality database knowledge.</p>
<p>Receiver Requirements</p>	<p>Give feedback of the information, add more information</p>	<p>Contact person, good documentation of the issues</p>	<p>Follow the recording requirements, deal the regulation, anonymise the data</p>	<p>See AaaS, no need for anonymisation, though.</p>	<p>The data must be anonymized anyway, so the regulation might not be such a challenge. The subject needs to agree to the sharing and additional use of the data.</p>
<p>Other things to consider</p>	<p>Look for Fieldtrip, Brainstorm, and MNE.</p>		<p>Start from pre-processing of the data. Evaluating the data quality. Focus on specific application. The customer could upload data and choose what to look for (e.g. remove the eye blinks). Lyon MEG site already offering this for epilepsy. See AAI Scientific Cultural Services Limited http://www.aaiscs.com</p>	<p>Could be technically possible already now. Start from preprocessing, maybe spike detection and analysis. See CATi Project</p>	<p>Can be challenging to create a framework that fits the needs of various customers. Fieldtrip starting already, fMRI has multiple. Imagen, European project, combining MRI and genetic data, access with web tools. Benchmark them. When it gets big, the data needs to be decentralized. A grid storage.</p>

Table 4 Service Ideas Proposed by the Customers

Service	Periodical Customer Meetings
Offering	To build the community. Learning to know the people behind the usernames. 1-2 days.
Funding	By the company. Invite prospective customers to learn more and network.
Provider Requirements	Organize the venue, accommodation, program etc. Ask the community for hot topics.
Receiver Requirements	Pay for travel, some to give presentations
Other things to consider	XX and XXX were doing this

Customer interview 4 (Data 2d)



TOPIC: __Testing the Proposed Service Ideas__

Information about the informant

Table 1

Details	
Name (code) of the informant	Persons A & B
Position in the organization	Associate Professor (practically head of the lab) & Lab technician
Date of the interview	7.5.2014
Duration of the interview	10:10 – 12:25
Document	Field Notes

Field notes

Table 2

	Themes of the interview	FIELD NOTES
0	Background	- The customer thought they had bought a clinical product. Their focus is

		in clinical applications and clinical research.
1	Proposed Services	- See next page
2	Other Service types?	- See Table 2

“Feeling of being fooled by the case company” as the product is not a clinical product like promised

Epilepsy analysis may take even three days

Starting a lab takes two or more years

Providing the proposed services could create substantial income for the customers

It is challenging to get funding for additional services. They are easier to bundle in the system sales as single transactions than to apply for an additional funding after acquiring the system.

Table 3 Feedback of the Preliminary Proposal

Service	User Community -> Formalized Knowledge Base	Expert Pool	AaaS	CAD (in comparison to AaaS)	Data Pool
Offering	Don't need to know people to find information.	Customers: knowledge of the experts Experts: learn more, build networks	Lower staff and knowledge reqs, faster startup. Customers and current experts (as service providers) could be interested.		Training/tutorial data where the customer would know what is the correct analysis result. Reaching the correct results would build users confidence and support training. Range from easy to hard cases. Could be just a DVD supplied as part of the training.

Funding	The payment should be embedded in the product sales. Trade-off between Elekta and customers. Should be considered as an investment for the future. Paying the community users based on their kudos.	Could be included as an option in the system sales. Hospitals might easily pay for the service in order to save costs.	Customer pays per patient or a package of patients.		Part of system sales.
Provider Requirements	Specialists of different areas, maybe from the expert pool. Someone to manage the work.	Provider: Select correct experts. Project management. It could be an open platform: the customers buying the service directly from the experts and rate the service afterwards. How would the money transfers work in this case? Experts: Able to speak in new customers' language	Knowledge, expertise. Signing of patient reports done by MDs. Strictly defined input and output.		Select data, define the background clinical information, define the correct analysis outcome.
Receiver Requirements	Certain level of basic knowledge.	Nothing	Good data quality meeting the requirements of the service provider		Basic training
Other things to consider	Only for clinicians, the physicists don't want to listen the clinicians. The clinical processes should be done by the clinicians. For a new user it would be hard to find the important/correct info from a huge variety of comments in a community. -> Gather existing knowledge	Building it should be triggered by the case company.	Ioannides had a try but the prices were too high, the process not documented, and he isn't a clinician. The huge variety of effort needed per patient makes setting the price tricky	Should be part of software development, not a service	Already existing for research: MINDSET & ?

	from the communities into formalized knowledge base. EUMEGS?				
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Table 4 Service Idea Proposed by the Customer

Service	Coaching
Offering	The customer gets a coach to get started up and support the learning etc
Funding	The MDs are already doing this after their graduation
Provider Requirements	Select the correct person based on the customer needs. An epilepsy guy for epilepsy customer. The coaches need coaching skills. The coaches should be trained by the provider.
Receiver Requirements	Nothing.
Other things to consider	Also technician coaching "Providing fishes vs. teaching how to fish"

Evaluation of the final proposal (Data 3)



TOPIC: __Evaluation of the Final Proposal __

Table 1 Information about the informants

Name (code) of the informants	Management
Date of the interview	12.5.2014
Duration of the interview	15:10 – 17:20
Document	Field Notes

Table 2 Feedback of the Final Proposal

Service	User Community Portal	User Meetings	Expert Pool	Coaching	AaaS	Training Data Pool	Customer access to CRM
Offering	Good	Agree	Agree	Agree	Agree	Agree	Agree
Funding	Could be free, but official support would be chargeable	How to make it profitable?	Agree	Agree	Agree	Could it be chargeable?	Could it be chargeable?
Provider Requirements	Agree	Agree	Agree	Agree	Agree, but how to address the regulation?	Agree	Agree
Receiver Requirements	Agree	Agree	Agree	Agree	Agree	Agree	Agree
Other things to consider	If it would be officially under the company, it could build the brand. Could use the experts to review the articles.	Possible to collaborate with the corporate? Hard to imagine customers getting interested. Maybe utilise webinars, to enable larger access. Already had this in the turn of millennia.				Should already be part of the training package	Start to investigate the current state of the project