American Journal of Industrial Engineering, 2013, Vol. 1, No. 2, 12-19
Available online at http://pubs.sciepub.com/ajie/1/2/2

DOI:10.12691/ajie-1-2-2

Exploring the Service Business Potential in a Product Oriented Manufacturing Company – Introduction of the 5+1 Approach

Jukka Ohvanainen, Emmi Hakala, Esa Hietikko*

Mechanical Engineering Department, Savonia University of Applied Sciences, Kuopio, Finland
*Corresponding author: esa.hietikko@savonia.fi

Received August 11, 2013; Revised September 03, 2013; Accepted September 04, 2013

Abstract The service business is seen as one of the most significant industrial trends of our time. Physical goods and technology no longer provide sufficient competitive advantage for manufacturing. Many industrial companies have noticed the potential of service business, but only few have achieved significant success. This paper introduces how to explore the service business potential in product oriented industrial firm while minimizing risks related to service business development. In our NSD approach, we design service concepts by participating customers within the 5+1 step design process. In order to seek the business potential, deep customer understanding is a necessity. Service concepts, in which the customer understanding is gathered through the process by participating end users and network partners, act as a decision tools when making go/kill decisions about the productization and further service business development actions.

Keywords: *industrial service business, service concepts, NSD (New Service Development), service products*

Cite This Article: Jukka Ohvanainen, Emmi Hakala, and Esa Hietikko, "Exploring the Service Business Potential in a Product Oriented Manufacturing Company – Introduction of the 5+1 Approach." *American Journal of Industrial Engineering* 1, no. 2 (2013): 12-19. doi: 10.12691/ajie-1-2-2.

1. Introduction

Many industrial companies have noticed the potential of service business. Still only few of them have achieved significant success. In our inquiry Finnish technology companies did see services as a potential path for the business development and growth. In a five year period, companies expect to raise the share of service revenue from present 10 to 20 per cent (median). This means that there is a 10 per cent gap between strategic intentions and current state.

When asked about the challenges related to service business, companies named four the most significant as follows: lack of resources, undeveloped service design processes and models, product oriented business culture and feeling of risky business. In this paper we introduce our practices to overcome, or at least lower, those challenges and achieve strategic goals. Additionally, we discuss how to develop new service concepts while verifying the potential of service business.

2. Theoretical Framework

It has been said that the service business is one of the most significant industrial trends of our time as physical goods and technology no longer provide sufficient competitive advantage for manufacturing [1,2,3,4]. The trend is toward services and integrated solutions as customers value attributes increasingly consisting of non-physical elements [2,5].

2.1. Motivation and Challenges

Some of the motivating factors behind the shift toward "servitization" are listed in Table 1.

Table 1. Motivation to enter or extend service business

Argued Benefit	Author(s)
Better gross margins.	[6,7,8]
Increased competition among manufacturers has reduced product margins.	[9]
More continuous revenue streams – services are not so vulnerable to economic cycles.	[10,11]
A growing installed base of products.	[8,12]
Customer's pressures to increase efficiency and focus on core businesses have led to an outsourcing trend – customers demand services out of their competence.	[12,13]
Services strengthen the company's competitive position – better customer loyalty and satisfaction.	[9,14,15,16]
Non-physical services and the value generation processes behind them are more difficult to imitate by competitors as competitive advantage has been built through organizational learning.	[17,18]

Beside stated benefits, extending or entering service business in a manufacturing firm contains also some major risks and challenges discussed through in Table 2.

Table 2. Risks and challenges of service business

Argued Risk or Challenge	Author(s)
Creating and managing non-physical services is challenging especially in product orientated firms due to lack of experience and competence.	[19]
High investment in extending service business leads to increased service offering and costs, but does not realize the expected returns or growth of turnover – manufacturer fallen to the "service paradox".	[18,19]
Danger of losing strategic focus and fallen into the middle ground of two businesses - neither of businesses, product or service functions, have no sufficient resources.	[8,18,20]
It is challenging to motivate employees to sell service contracts worth 50 000 € instead of machines worth significantly more.	[17]
Change path will be, most likely, to be more challenging and time consuming, the larger and wider the organization is.	[16]
Strategy formation is challenging (= risky) without deep customer understanding: strategies are based on presumptions and speculation.	[5,16]
Building of service culture is challenging due to employees resistance to change.	[16,18]
Pricing, selling and marketing of services or service offerings are challenging due to lack of experience and capability.	[6,18]

2.2. Industrial Services and Service Concepts

According to Tekes [21] service business is a business in which a service forms the basis of value creation. Meanwhile, industrial services can be categorized to SSP (Services Supporting the Product), SSCP (Services Supporting the Customer's Processes) and SSCB (Services Supporting the Customer's Business) categories [22]. In this paper traditional lifecycle services are seen as a part of SSP`s and SSCP`s as illustrated in Figure 1.

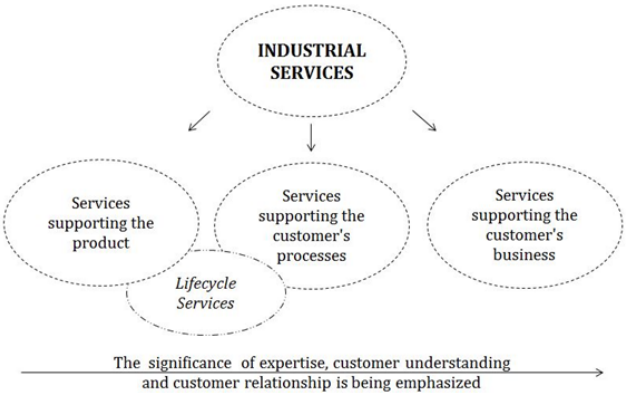

Figure 1. Categorization of industrial services [5]

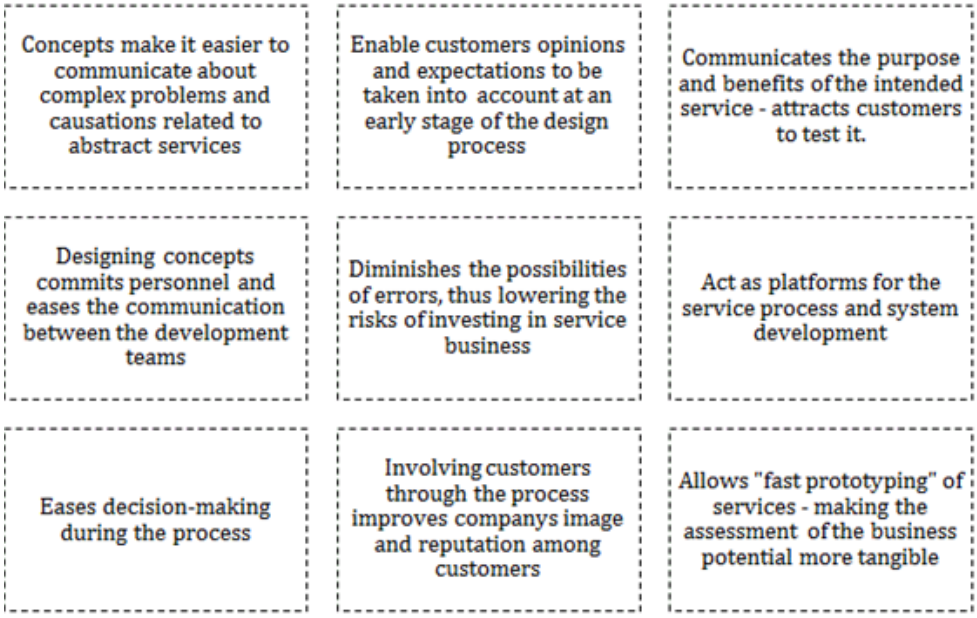

Figure 2. Benefits of service concepts (Collected from: [5,23,26,27])

Moving from SSP's to SSCP's and SSCB's means that the significance of expertise, customer understanding and customer relationship are highlighted [5,22]. Davies et al. [11] state that successful suppliers of products have achieved their prosperity by providing innovative combinations of technology, products and services – in other words, serving their customers with solutions assembled to meet customer needs and value attributes. It is important to notice that the potential of service business not only lies on product or process supporting services. In many cases companies already have the "hidden" expertise that could be converted to services supporting customers business – they just have not noticed it or lack the capability to productize it [5].

How to explore those service opportunities then? The answer lies on the service concepts. According to Goldstein et al. [23] service concepts play a key role in service design and development as they are the missing link between the actual customer needs and the developer's strategic intent. The service concept not only defines the *how* and *what* of service design, but also ensures integration between them. We define service concept as a *visualized description of the potential or intended service product*.

Service concept that serves as a basis for a business's activities and decisions should include at least the following characteristics:

- Description of the verified customer needs
- The value promise for a customer
- A revenue generation model
- The most central properties of the service

- Intended service process and service system
- Resources and partners needed to develop and produce the service product [5,21,24,25]

What is the motivation behind service concept development? According to the literature there are several reasons (see Figure 2) why an industrial company should fall into the world of service concepts.

2.3. Service Development Processes

The abbreviation NSD (New Service Development) refers to the development process of a new service. Edvardsson et al. [8] crystallize NSD as the process from idea to launch of a new service. Some of the known NSD processes are presented in Figure 3. Concept phases are highlighted in order to clarify the central meaning of concepts as core elements of the design and development process.

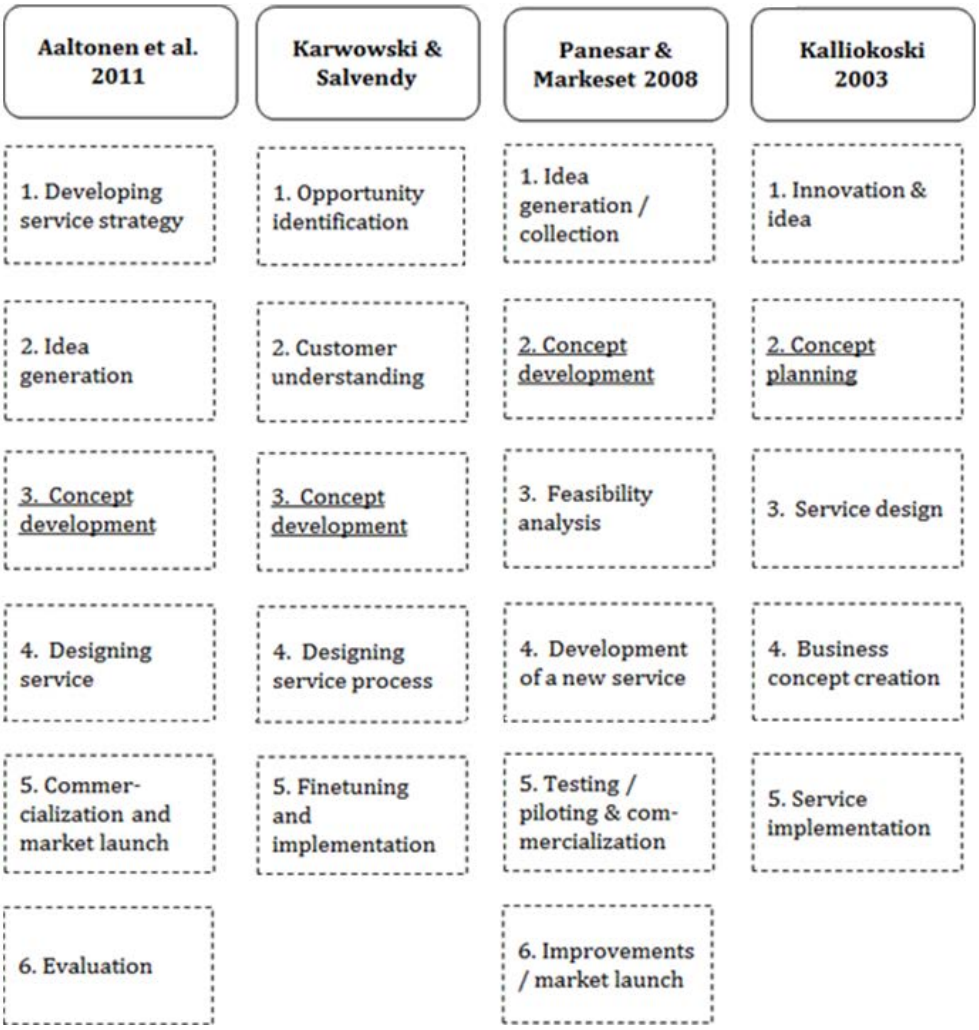

Figure 3. Known NSD processes [5]

Table 3. Issues to be considered in strategic deliberation and analysis phase (Modified from [5])

Internal Issues	External Issues	Advisable conclusions
*Identification of current core-business and know-how. Could we productize the know-how in a novel way? *Critical analysis of the current and desirable business strategy *Analysis of existing service portfolio or services – successful / failed services? *Analysis of current service processes *Are we actually already providing some potential service to customers but because of inadequate productization, or any other reason, we do not receive any income?	*Market and business analysis – present stage, growth potential and development areas *Identification of business trends and weak signals as well as potential change paths *Analysis of competitors business and service strategies, service portfolios and service processes *Customers core-businesses, obvious and hidden needs, strategic intentions and priorities	*Potential development paths *Identification of potential customers and market segments *Decision to launch concept development project and/or further development of existing service(s) *Objective setting Resourcing, timetables, responsibilities

In order to summarize given NSD processes the simplified three step "service innovation process" suggested originally by Grönroos et al. [13] is presented below:

1. Strategic deliberation and opportunity analysis
2. Development of service concepts and processes
3. Productization and market launch

The first step "strategic deliberation and opportunity analysis" refers to an action where an industrial company has to consider both internal and external issues [28] with regards to the service business extension. Those issues and advisable conclusions to be done before concept development are discussed in Table 3.

Concentrating more specific on the process of the service concept development (second step of the innovation process), Markku [26] suggests the three stage service conceptation and prototyping process:

1. Collection of the customer, end user and business environment related information
2. Combining and refining the collected information (Innovative phase of the process)
3. Visualization of the results (concepts) into an understandable form

Concept development process can be implemented after the authorization of project plan has been done and the target segment or customer is selected [5]. In order to achieve success in service business, thorough understanding of the customer's business, processes, circumstances and environment is a mandatory [13,29]. Customer's participation through the process [30] is the applicable way to get access to the customer's value creation processes which are difficult to study via market research or related exercises [31]. Therefore the importance of customer interface information is highlighted in the service development.

The productization and market launch can be understand as a phase where the actual *easy to sell and easy to acquire service product* takes it "final" form before launching it. The content is dependable on how advanced the developed service concepts are. According to Rekola & Haapio [32], the cornerstones of service productization are:

- The name
- The price
- The configuration and packaging
- The quality standards
- Intellectual property rights
- The service description/specification
- Proactive service contracting

Before market launch actions the service product should be tested. Through testing service products can be configured to meet the different needs of market segments. One recommended way of testing is to pilot service with selected customers.

3. Methodology

The starting point and motivation for this research activity came from the local industry itself. As mentioned, companies that participated in our inquiry did see service business as a potential growth path. Partially due to the challenges like lack of resources, undeveloped processes and models, product oriented business culture and feeling of risky business, there is a danger that the potential remains undiscovered.

In order to help companies overcome, or at least lower, those challenges we started a service business research aiming to develop new approaches for industry driven service development. Four local companies were invited to take part in research proceeded through pilot projects. Pilot companies are product orientated manufacturers that had desire to develop or extend their service business. Considering their different backgrounds and perspectives, we implemented real life development projects where the 5 + 1 approach were tested and designed by participating the end users (customers) and personnel to the development of services, partner models and service products.

In order to illustrate the idea and the potential of the given approach, we discuss one pilot project through in more detail way. In this particular case the pilot company is a subcontractor producing welded assembling's and components for machinery industry while the strategic desire is to gain cash flow and competitive advantage also from services. In the other words, the goal of the project was to hunt down whether there are potential for greater service business alongside the manufacturing.

4. Findings: Introduction of the 5 + 1 Approach – Case Subcontractor X

The potential of service business is there. Companies just have to find it. In pilot projects, new service concepts illustrating the potential of service business in certain market segment were hunted down by following the 5 + 1 approach presented in Figure 4. The process is customizable taking the appropriate shape considering the needs of the individual projects.

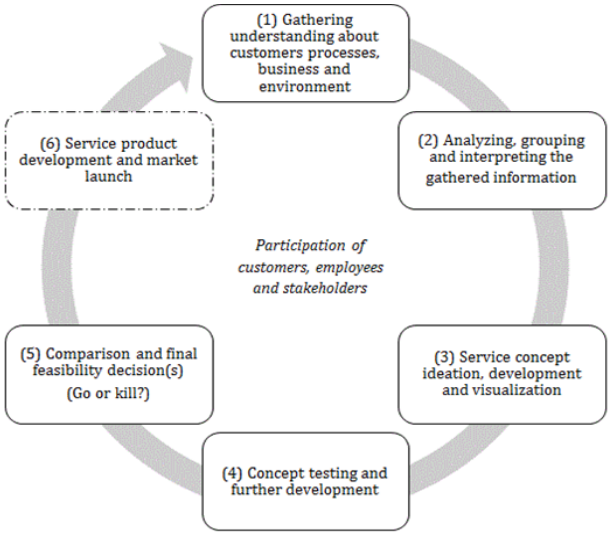

Figure 4. The 5 + 1 approach for service concept development

Five first steps are actual concept development phases while sixth step (+1) concerns service product development containing own, but not separate, entity of actions. Simplifying the idea: service concepts, in which the customer understanding is gathered, act as platforms and decision tools when assessing the potential of service business. Concepts define whether it is profitable to a) enter to the service business development path and b) implement the service product development project.

In the next sections one pilot project is replayed step by step according to exploited 5 + 1 process. Before implementing the 5 + 1 process, in the preceding deliberation phase producibility know-how were identified as one of the core expertise of the pilot company by internal auditing. Thus, the goal of the project was to

explore the potential with relation to producibility service opportunities. How customers design their products and can participate in at the early stages of the development process in a value adding way? Is there any demand for outsourcing?

4.1. Gathering Customer Understanding

In order to gather needed customer information at this stage, two key customers were invited to participate in. As the clientele of subcontractor x is rather homogenous and scarce, these two significant customers were considered as a sufficient sampling for the concept development.

In order to gain customer understanding two separate customer workshops were conducted. From the customer side executives, development managers and product designers were involved to the tripartite co-creative workshops lead by authors. The progress of gathering customer understanding is presented in Table 4.

Table 4. The progress of phase 1

	Goal	Result
I Workshop with customer A	Discuss through phases and actions that have to take into account in a producibility analysis process in order to gain maximum benefits	"Optimal" process from the perspective of designing producibility including phases in which the pilot company should be involved
Internal workshop with the pilot company	Amplify the developed process	Concrete visualization of the service path from the customer perspective: phases, interfaces, responsibilities, communication channels. Make the idea of the service more comprehensible
II Workshop with customer B	Introduce the idea of the intended service process and further develop it. Find out the demanded requirements in order to be a desired service provider.	Current issues of customers processes and business Customer become interested in acquiring the service

4.2. Analyzing the Gathered Information

The first and second step of the 5 + 1 process were partly overlapped. The further interpretation of the gathered information contained mind maps and process correctives in order to outline the gathered customer understanding and make it rational. In this particular case, it was natural to concentrate in mapping the information into the form of service process, as it is the key part in order to provide producibility service efficiently and value adding way.

Simplifying the idea of the second phase; the gathered information has to be shaped into a form in which the overall picture can be created and concept ideas derived. Practical way is to divide information into smaller entities for example by service categories, concept ideas or process phases.

4.3. Concept development and visualization

In an actual concept development phase several concept suggestions were made. In order to bring external expertise to the concept development a group of product design and producibility experts were established.

The important question was how to be able solve those problems and meet the demands that came up in customer workshops. Earlier visualizations and service process models acted as platforms when the concept ready for piloting were derived. Simplifying the idea of the created service concept:

- The central service promise to the customer is to ensure the cost efficiency, quality, functionality and optimal manufacturability of a product or subassembly at an early state of the design process.
- The promise is fulfilled by exploiting the standardized visualized service process giving agility and speed to the product design and development.
- The most central properties of a concept are: a) Feature specification b) Producibility analysis (report) c) Prototype design d) Testing and e) 0-series.
- The revenue model is douple-edged: Firstly the customer pays from those service modules selected and secondly services are expected to speed up the manufacturing side. Both, service modules and manufacturing services can be acquired separately.
- Service is provided using the current personnel supplemented by the expertise of network partners if needed. Any major investments are not needed at this stage.

In addition to producibility services, also possibilities for providing consulting services in product design were discussed. Eventually the wider concept of design services was abandoned due to lack of human resources and larger risk in terms of the needed investments.

4.4. Testing and Further Development

As mentioned in Table 4, due to customer workshop II customer B become interested in acquiring the proposed service. Companies decided to start a pilot project where the service concept was tested through.

The progress and observations of the service process was documented accurately in order to trace those points that need further attention to be able produce service in a value-adding way without any pointless actions. Both parties documented the process on their perspective and eventually a common workshop was arranged.

As a consequence of the piloting the value of the intended service was proved as the results were desired. Additionally, as a significant outcome, the service process was further standardized in terms of methods and documents involved. For example the form and content of producibility analysis report took its final form.

4.5. Comparison and Feasibility Decisions

Due to testing and preceding phases, the evidences of service concept potential were high and the risks were minor while the potential demand for the service was obvious. Against this background, the decision to implement service product development and launch project was straightforward.

At this point, there were couple big questions to be solved in productization phase: Whether to package services to bundles or offer them as separate modules? Should the physical side of manufacturing to be packaged with producibility services or not? In order to solve this debate, we decide to ask from the customers.

4.6. Service Product Development and Launch

To be able turn the producibility service concept into *easy to sell and buy service product*, several issues were under the discussion:

- Naming
- Selecting the packaging logic
- Pricing: Revenue generation model, pricing policy and pricing method
- Service contract technique
- Standardization of a service process (Always a certain limit of standardization)
- Communication and commercial solutions
- Market testing and market launch

As mentioned, we wanted to test different versions of the service product before launching the final solution. In order to do so, several alternative versions were developed, visualized and suggested to customer A and B in separate workshops. Differences were mainly on packaging and pricing logics. Also the service contract form was tested and co-designed with customers.

As a result of the testing packaging of service modules into bundles were rejected. Customers stated that on their perspective service modules (feature specification, producibility analysis, prototype design, testing and 0-series) has to be offered as individual services giving customers freedom of choice. This actually simplified the pricing and service contract design as we were able to set the price per module meaning that the total price of the contract is the sum of the selected modules. It came also evident that service and manufacturing contract has to be segregated due to related physical elements like parts and materials. The pricing of both at the same time was too complicated and did not add one value to the customers.

The last duty was to launch the developed service product. No matter how valuable the service might be if customers do not notice the existence of it. In order to raise the awareness, the following actions were made at this point:

- New visualized service brochures – can be exploited in negotiations, presentations and exhibitions
- Reformed home pages

Due to relatively scarce current clientele, direct marketing is the most effective way of marketing in terms of return of marketing investment. It is important to notice that the development process itself was an important tool for service launch as customers became aware of the service and even committed to acquire it.

5. Discussion

5.1. Service Business Potential in Pilot Companies

When implementing the 5 + 1 approach in our pilot projects we found service opportunities in every service category (SSP, SSCP & SSCB). In general, SSCP and SSCB opportunities are harder to indicate as they need deep delve into customer's processes and business. In order to indicate and satisfy the hidden needs, it is necessity to create concepts and service products in cooperation with customers.

When talking about machinery industry companies (main suppliers), in many cases their customers even started to require product (SSP) and process (SSCP) related services as they are necessity in order to run the everyday operations efficiently. Generalizing, the major service potential among machine providers lies on proactive services such as auditing, preventive maintenance and spare part agreements. In addition, also training and instruction services were demanded. Current services are mostly reactive ones, such as singular spare parts deliveries and repairs causing problems on both supplier and customer side. In proactive services the revenue potential is less fluctuating as a result of longer service contracts and agreements.

Moving from machine providers to subcontractors, created concepts were actually more like partnership models where a "former" subcontractor takes more responsibility of product design and development, testing and other business related actions. From the main suppliers perspective services like producibility analysis and material optimization were demanded as they are not necessarily the core expertise of machine providers. Providing these professional services require strategic partnership among the associates meaning transparent sharing of knowledge, common information systems and compatible processes.

5.2. Lessons from the Pilot Projects

Our study indicates that in every pilot company there was a potential for entering or extending the service business. Risks and challenges are also there, but with using the 5 + 1 approach those can be limited or even avoided. One obvious risk relates to the fact that companies tend to speculate which services customers might value. If investments and development decisions are based on beliefs, the risks of failure and immersing themselves into the service paradox are high. These particular risks were verified in every pilot project. By participating customers to the development through the process, the decisions and further actions are based on "harder ground".

From the managerial perspective, it is worth to get not only customers to participate but also employees to the design and development of services. The development of a service culture in product orientated company will in any case take time. Why not start in time? Motivated executives are the first step but also employees should be involved in. The accumulated knowledge about customers and their value attributes should be exploited when designing services. Besides gathering the valuable information from customer interface, the second reason is about motivation and culture evolution: participation means commitment while the resistance of change is reduced. Pilot project experiences emphasize the importance of employee participation.

The importance of visualization of service concept and service products must be highlighted. As services are more abstract than products, the visualization makes them easier to understand by customers and other interest groups. It is difficult to test services internally or externally without making them visible and easy to understand.

Testing of concepts and service products prevents worthless investments and reveals those service features

that have to be modified before the market launch. In addition, service concepts are efficient testing platforms when exploring the modification demands of different market segments or customers while facilitating productization and portfolio development phases.

6. Conclusions

Exploring the service business potential in a reliable way is the first and necessary step in a path toward service business entering or extension. Visualized service concepts are efficient tools when assessing the service business potential as they embody the gathered customer understanding. Concepts act as platforms when the feasibility decisions about productization and service business investments are done. Concepts developed for the certain market area can be exploited also as test platforms when considering the configuration needs of different market areas and customers.

Industrial service business is about competence to deliver customers maximum value-adding solutions. Thus, an industrial company cannot success without participating customers and networks partners through the development process as the efficient and value-adding delivery of services and solutions requires commitment and common interest from all parties.

An important area for the future research is the management of service business change path – inevitable challenge for all product orientated companies. How to create and implement successfully the service business strategy? What organizational or network modifications should be done and how to ensure the motivation and know-how of employees?

Acknowledgement

This research has been supported by the European Structural Funds programme for Eastern Finland through the research project LEKA.

References

[1] Baines, T. S., Lightfoot, H. W., Benedettini, O. & Kay, J. M. "The servitization of manufacturing: A review of literature and reflection on future challenges," *Journal of Manufacturing Technology Management*, 20 (5). 547-567. 2009.

[2] Brax, S. A. & Jonsson, K. "Developing integrated solution offerings for remote diagnostics. A comparative case study of two manufacturers," *International Journal of Operations & Production Management*, 29 (5). 539-560. 2009.

[3] Edvardsson, B., Gustavsson, A., Johnson, M.D. & Sandén, B. *New Service Development and Innovation in the New Economy*, Studentlitteratur, Sweden, 2000.

[4] Gebauer, H., Ren, G-J., Valtakoski, A. & Reynoso, J. "Service-driven manufacturing: Provision, evolution and financial impact of services in industrial firms," *Journal of Service Management*, 23 (1). 120-136. 2012.

[5] Ohvanainen, J. *Palveluliiketoiminnan kehittäminen tuote-orientoituneessa teollisuuden yrityksessä*. Master's thesis: Lappeenranta University of Technology, Department of Industrial management. 2012.

[6] Anderson, E., Fornell, C. & Rust, R. "Customer satisfaction, productivity, and profit-ability: differences between goods and services," *Marketing Science*, 16 (2). 129-145. 1997.

[7] Edvardsson, B. "Cultural Change in the context of restructuring manufacturing firms towards service orientation," in Tekes Service Innovation Circus -seminar. 2010. [electronic-document] Available: http://www.tekes.fi/ohjelmat/Serve/Aineistot/Seminaariaineistot+2010

[8] Eggert, A., Hogreve, J., Ulaga, W. & Muenkhoff, E. "Industrial services, product innovations, and firm profitability: A multiple-group latent growth curve analysis," *Industrial Marketing Management*, 40 (5). 661-670. 2011.

[9] Gebauer, H., Bravo-Sanchez, C. & Fleich, E. "Service strategies in product manufacturing companies," *Business Strategy Series*, 9 (1). 12-20. 2008.

[10] Anderson, P. *Jackpot or fool`s gold: services as a dynamic capability in product innovation*, Publication 245, Massachusetts institute of Technology, Cambridge, 2008.

[11] Davies. A., Brady, T. & Hobbay, M. "Charting a path towards integrated solutions," *MIT Sloan Management*, 47 (3). 39-48. 2006.

[12] Kosonen, V. *BestServ: Industrial service business strategy. Generic framework and case examples*, Teknologiateollisuus ry, Helsinki, 2004.

[13] Grönroos, C., Hyötyläinen, R., Apilo, T., Korhonen, H., Malinen, P., Piispa, T., Ryynänen, T., Salkari. I., Tinnilä, M. & Helle, P. *Teollisuuden palveluksista palveluliiketoimintaan - Haasteena kannattava kasvu*, Teknologiainfo Teknova Oy, Helsinki, 2007, 172 p.

[14] Gebauer, H. "Identifying service strategies in product manufacturing companies by exploring environment-strategy configurations," *Industrial Marketing Management*, 37 (3), 278-291. 2008.

[15] Gebauer, H. & Friedli, T. "Behavioral implications of the transition process from products to services," *Journal of Business & Industrial Marketing*, 20 (2). 70-78. 2005.

[16] Ojasalo, K. "Developing industrial services – an empirical study," *The Business Review*, 7 (1), 58-62. 2007.

[17] Oliva, R. & Kallenberg, R. "Managing the transition from products to services," *International Journal of Service Industry Management*, 14 (2). 160-721. 2003.

[18] Fang, E., Palmatier, R. & Steemkamp, J-B. "Effect of service transition strategies on firm value," *Journal of Marketing*, 72. 1-14. 2008.

[19] Gebauer, H., Fleisch, E. & Friedli, T. "Overcoming the Service Paradox in Manufacturing Companies," *European Management Journal*, 23 (1), 14-26. 2005.

[20] Nordin, F., Kindström, D., Kowalkowski, C. & Rehme, J. The risks of providing services. "Differential risk effects of the service-development strategies of customization, bundling, and range," *Journal of Service Management*, 22 (3). 390-408. 2011.

[21] Tekes. *Palveluliiketoiminnan sanasto – Vocabulary of Service Business*, Teknologian ja Innovaatioiden Kehittämiskeskus, 2010. [Electronic-document] Available:http://www.tekes.fi/fi/community/Julkaisut%20ja%20utiskirjeet/333/Julkaisut/1367?pager.offset=250&aihealue=kaikki&julkaisusarja=kaikki&sortBy=nimi&sortDirection=desc

[22] Turunen, T. T. & Toivonen, M."Organizing customer-oriented service business in manufacturing," *Operational Management Research*, 4 (4). 74-84. 2011.

[23] Goldstein, S.M., Johnston, R., Duffy, J. & Rao, J. "The Service concept: the missing link in service design research?," *Journal of Operations Management*, 20 (2). 121-134. 2002.

[24] Aaltonen, A., Siltaloppi, J. & Puhto, J. *Asumisen palvelukonseptit – Palvelukonseptin kehittämisen prosessimalli*. Working paper 4/2011, Aalto University: Department of Civil and Structural Engineering, Espoo, 2011.

[25] Salmi, P. "Palvelujen kehittämisestä asiakastarpeeseen," in Finas-päivä -seminar. 2009. [electronic-document] Available: www.mikes.fi/documents/upload/pekka_salmi_finas-paiva_2009.pdf

[26] Markku, R. "Palvelun konseptointi ja prototypointi," in Tekes Service Innovation Circus -seminar. 2010. [electronic-document] Available: http://www.tekes.fi/fi/gateway/PTARGS_0_201_403_994_2095_43/http%3B/tekes-ali1%3B7087/publishedcontent/publish/programmes/serve/documents/seminaariaineistot/reijomarkku.pdf

[27] Miettinen, S. *Palvelumuotoilu: Uusia menetelmiä käyttäjätiedon hankintaan ja hyödyntämiseen*, Teknologiateollisuus ry, Kuopio, 2011.

[28] Kindström, D. & Kowalkowski, C. "Development of industrial service offerings: a process framework," *Journal of Service Management*, 20 (20). 156-172. 2009.

[29] Paloheimo, K-S., Miettinen, I. & Brax, S. *Customer oriented industrial services*, Helsinki University of technology, BIT Research Centre, Espoo, 2004.

[30] Ojasalo, J. & Ojasalo, K. 2008. *Kehitä teollisuuspalveluja* Talentum Media, Helsinki, 2008.

[31] Toivonen, M. & Tuominen, T. Emergence of innovations in services. The Service Industries Journal. Vol. 29, No. 7. pp. 887-902.

[32] Rekola, K. & Haapio, H. *Industrial services and service contracts – A Proactive approach.* The Federation of Finnish Technology Industry, Helsinki, 2009.