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Service productisation through standardisation and modularisation: an exploratory case study

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ABSTRACT

This research study examines service productisation through the standardisation and modularisation of service. This concept is studied and applied to a professional service company which is running a productisation project for improving its services. This productisation project continues further through defining, describing, and developing a service platform and standardisation of its overall services. The main objective of this study was to promote sales through the identification and definition of products and their accompanying services. Moreover, the study explores and applies service development models, namely the model of integrating markets, modular service platform, identification of modules using design structure matrix (DSM), and model for service automation. Furthermore, the study also aims to find solutions for the standardisation and modularisation of services through these models and investigates the associated benefits and issues related to overall services.

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Standardisation; productisation; modularisation; service development

1. Introduction

Services are complex and intangible if they are not clearly defined for potential customers (Arabi, Mansour, and Shokouhyar 2018; Grönroos 2020; Wirtz 2021). This makes services challenging and difficult to position, differentiate, and sell (Gremyr, Valtakoski, and Witell 2019). Although intangible, services should nevertheless be treated as solid objects that can be used very much similarly to tangible products (Liozu 2017; Hirata 2017, 2019). Service managers who have a better understanding of service goods may be able to overcome a variety of obstacles. According to a past study, many service managers struggle with describing, promoting, and pricing services when the content of the service provided is ambiguous and continually changing (Clemes, Mollenkopf, and Burn 2000; Verma 2000). Furthermore, clients frequently struggle to comprehend a service provider's value propositions, necessitating more precise and clearly defined products that reduce ambiguity and customer risk perceptions (Goduscheit and Faullant 2018; Venugopal and Saleeshya 2019). Nowadays a big part of the industry structure in developed countries consists of services. The Western economies have changed; in the past, the markets were to a great extent product driven, but now economies have shifted to service-driven, information-based markets (Johnson et al. 2000; Eloranta and Turunen 2015, 2016; Brodie, Löbler, and Fehrer 2019). Increasing global competition is forcing organisations into continuous renewal of their services. Therefore, service development and design are important.

Productisation is one way to confront the challenge of developing services in service companies. This term has many meanings, and there is little scientific research on the subject. The productisation concept belongs under the discipline of service design and development (Kotler and Armstrong 2001; Harkonen, Tolonen, and Haapasalo 2017; Sánchez-Gutiérrez et al. 2019; Zhang, Gu, and Jahromi 2019). The productisation of professional services means service definition, design, development, and description to maximise the benefit for the customer and achieve the set objectives concerned with the firm's performance (Beltagui et al. 2017; Valtakoski and Järvi 2016; Elia, Gnoni, and Tornese 2019). An extreme way to productise services is to standardise the services as standard products. A service is produced, for example, when it can be sold to the customers as a clear service package, or when the service model can be customised to be customer-specific by using service modules, for instance in the healthcare service context (de Blok et al. 2010, 2014; Silander et al. 2017), or in legal services (Giannakis et al. 2018; Yrjönkoski and Systä 2019).

Standardising services is possible by creating modularity, mass customisation, and service platforms for the service design and structure (Pekkarinen and Ulkuniemi 2008; Rintamäki and Kirves 2017; Liu and Yao 2018). Modularity refers to defining standardised sub-components of a service whereby the service can be assembled, for example, on a standard service platform (Hölttä-Otto 2005). Mass customisation occurs by combining the standard modules to create an individual service package for a customer. Mass customisation enables large variety despite having standardised modules and service production (Pine 1993; Mourtzis et al. 2018; Eggert et al. 2018).

Although it is beneficial for companies to standardise their services through the combined effort of modularity, mass customisation and developing service platforms, very limited work has been done in this regard. Such combined efforts may create extra value to companies in improving their overall customer satisfaction. Keeping in mind such

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objectives, and in filling this research gap, the study illustrates how such combined efforts can positively impact in improving the overall servitisation strategy in companies. This study, therefore, looks at the standardisation and modularisation of services as a means of service productisation. This idea is researched and practiced by a business organisation that offers professional services. This service provider is working on a productisation effort to enhance its offerings. By defining, characterising, and establishing a service platform, as well as standardising its entire services, this productisation effort is moving forward.

Moreover, this study investigates and employs three models for service development: the model for service automation, the model for integrating markets, and the model for modular service platforms. It explores the advantages and problems connected with overall services and seeks to address the standardisation and modularisation of services through these models. This study researches the standardisation of services by bringing concepts familiar in product development into the services context; the purpose is to explore standardisation, modularisation, mass customisation, and platforms. The added value of this research is to study service standardisation and related models, examine the benefits and drawbacks of platform thinking and service standardisation, and find a way to identify modules in services. Furthermore, the research adds to knowledge about the little researched service development area in general and also specifically in terms of the studied case company.

The rest of the article is organised as follows: Section 2 outlines a literature review related to service characteristics, customer value, and common marketing-related challenges in service companies. The study methodology is presented in Section 3, while service development is illustrated in Section 4. The empirical part firstly presents the productisation project in the company in Section 5 and continues with Section 6 concentrating on the standardisation of services within a specific service concept in the case company and presenting a discussion at the end of the section. Managerial implications are discussed in Section 7, and the study is concluded in Section 8 along with possible future directions.

2. Literature review

2.1. Common marketing-related challenges in service companies

The intangibility of services creates challenges for marketing, mainly because the services are difficult to communicate, describe, and determine to the customers. The customers do not know the result for sure before the buying decision (Alexiev, Janssen, and den Hertog 2018). Customers have trouble evaluating services and separating them from competing services (Kotler and Armstrong 2001). Therefore, service companies should try to make intangible services more tangible.

Heterogeneity of service makes it consistent, of the same quality, and reliable, which is often difficult to produce. The operational inputs and outputs usually vary more than in goods production. Therefore, service delivery is not standard. The result of service depends on the employees' ability and willingness, as well as customers' ability to define their needs (Lovelock and Wirtz 2007). Usually, the more employees are involved, the less standard service delivery is. Especially with business services, it is important to ensure quality assurance actions, invest in systems preventing human errors, and think about automation possibilities in the service (Reim, Sjödin, and Parida 2019).

The simultaneous production and consumption aspect of services makes mass production difficult (Nishitani and Kokubu 2020). Additionally, the customers involved in co-production may have a negative or positive effect on the outcome and the employees have a big influence on customer satisfaction (Tsiotsou 2016). This aspect sets requirements for service personnel for doing the service correctly, so training and recruitment need to be of a high standard.

The perishability characteristic of services is problematic because it is not possible to have inventories for services. The problem of adequate workload is very common, especially in professional service companies, because it is a labour-intensive service. Additionally, it is difficult to divide the workload equally among employees because of the different competencies of the workers. Some solutions for professional service companies for the problems that the perishability characteristic brings are using resources productively, changing fixed costs into variable cost (this is difficult in professional service companies because labour is the fixed cost), and training employees in handling many tasks. (Zeithaml and Bitner 2000; Hutt and Speh 2004)

2.2. Service characteristics

In professional services customer contact is high and the customer spends a lot of time in the service process, which means low volume. Furthermore, the service is highly modularised, customised, flexible, and adapts to the customer's needs (Sundbo 2002; Carlborg and Kindström 2014; Brax et al. 2017; Broekhuis, van Offenbeek, and van der Laan 2017; Hyötyläinen and Möller 2007). Usually, professional services are rather process-oriented than product-oriented and the employees and their skills and knowledge are of higher importance than the equipment (Smirnov et al. 2018). The services are specialised from business-to-business: for example, management, IT consultancy, and other kinds of consultancy. The amount of these services has been increasing and developing a lot during the last few years, especially in developed countries (Trott 2008; Sivula et al. 2020).

2.3. Productisation of services

Productisation is one way to develop services. There are many meanings of productisation, one of which is defining, systematising, concretising, and at least partly standardising existing and new services (Harkonen, Tolonen, and Haapasalo 2017). According to Parantainen (2007), productisation means developing expert knowledge and know-how as a service product that can be effectively marketed, sold and delivered to the customers (Parantainen 2007). The purpose of productisation is to develop and reconstruct services to improve quality and

productivity, resulting in a competitive business. In addition, productising enables growth, better quality, productivity, and brings competitive advantage.

Treating the services as products and productisation makes the operation more professional, effective, and profitable. It is easier to tell customers about the services when they are designed according to customer benefit and not according to the company's processes. It is most important that the offered service solution solves a problem that the customer is experiencing. Productisation decreases the uncertainty of developing and producing the services. Productisation enables consistent and reproducible service delivery, which increases customer satisfaction, profitability, and quality. Productisation increases the growth of the company and increases margin and profitability (Radford 2004; Parantainen 2007).

Many drawbacks have not been identified related to service productisation. At least, one drawback of productised service can be that the needs of individual customers cannot be considered in a completely standardised service (Cavalieri et al. 2018). Additionally, the copying of the service, or at least service features, is easier. Since the services cannot be patented legally, the copying has to be protected in other ways, such as packaging, pricing, and delivering the services in different ways. (Parantainen 2007). There are different levels of productisation, namely producing internal working methods, product support for the service, productised service, and duplicated product.

2.3.1 Merits or benefits of service productisation

There are several merits or benefits to consider when implementing service productisation in companies. Various studies have been conducted in this regard to promote service productisation within companies (Valtakoski and Järvi 2016; Harkonen, Tolonen, and Haapasalo 2017; Mansoori, Harkonen, and Haapasalo 2022). This concept contributes to the efficient management of business processes and supports prosperity in the service business (Harkonen 2021). According to Löfberg and Åkesson (2018), service standardisation in certain service sectors might come from service productisation. From this concept, a better comprehension of the offering by all parties concerned is possible (Leppänen et al. 2020; Aquilante and Vendrell-Herrero 2021).

Productisation of service seems to have a significant impact on the service offering, processes, and the service delivery system, affecting a variety of company activities, including service development, service design, operations, and sales and marketing (Gremyr, Valtakoski, and Witell 2019; Wirtz 2021). According to Hannila et al. (2019), service productisation will enhance structural understanding of the service product and help create service modules. The merits of service productisation have been articulated variously, but all seem to aim towards improved effectiveness, consistency, value, and meeting customer needs (Harkonen 2021).

2.3.2 Challenges and/or limitations of service productisation

There are various challenges and/or limitations in service productisation. One of the challenges of service productisation is to transform intangible services into a more product-like and defined set of deliverables (Flamholtz and Randle 2000; Lovelock and Gummesson 2004). Often, studies on service productization focus on traditional product-based industries and exclude situations where the outputs are being sold only in terms of the service elements (Flamholtz and Aksehirli 2000). It is often challenging to engage employees in the productisation process due to its knowledge-intensive services and demands for cross-unit collaboration (Valtakoski and Järvi 2016).

Moreover, service productisation studies are also lacking in quantitative analysis of the impact on firm profitability, productivity, effect on the employees, and customer satisfaction and value (Valtakoski and Järvi 2016). Furthermore, there is a need to conduct additional research that employs case studies and theories to examine the productisation of service. Such extended studies may help practitioners and scholars to explore new ideas and empirical insights, which are useful in understanding how businesses have carried out productisation initiatives and the difficulties they have faced and advantages they have enjoyed.

2.4. Standardisation of services

The level of standardisation in the service products and production varies and is a strategic decision of any company. The standardisation of the service can vary anywhere between two extremes, which are unique service and a completely productised service. The basic principles related to the productisation of services are, first of all, developing a solution to a customer problem, finding out customer needs, and communicating the benefit to the customer. Secondly, defining the target group for the service is important. Thirdly, concretising services is effected by bringing tangible aspects to the service. Fourthly, constructing the service delivery and service delivery process as more reproducible and documenting it carefully is also of importance (Radford 2004; Parantainen 2007).

Standardising the services means making the service or service process reproducible to produce the service for many customers in the same way. This increases the effectiveness, profit, and quality of the service and service production. The selected level of productisation must add to the value of the service for the customer. A standard service does not consider the individual needs of the customers; therefore, the level of standardisation should be increased when the customers' needs are similar and the customer appreciates fast and cost-effective service, whereas adding the level of customisation is sensible when the customers' needs are different or the competitors have standardised services, in which case customised service can produce a competitive advantage (Saunders 2017).

2.5. Modularisation of service

Modularity was recognised as one of the ways to eliminate or reduce complexity, which also ultimately fosters success in mass customisation (Wang et al. 2011; Topcu et al. 2022). Generally, the concept of modularity has been applied in product development (Sohail and Al-Shuridah 2015; Azadi and Nourian 2021), but in recent times many researchers started to focus on the development of modularity in service (Ma, Wang, and Xu 2011; Johnson et al. 2021; Baghersad et al. 2022). Other studies have looked at how service modularity affects service customisation (Lin and Pekkarinen 2011; Silva de Mattos, Fettermann, and Cauchick-

Miguel 2021). Although various studies have looked at product and service modularity independently, there have been fewer studies that have examined modularity as a whole, such as the product-service system (PSS) (Voss and Hsuan 2009; Annarelli, Battistella, and Nonino 2016, 2020; Rennpferdt and Krause 2021). Li et al. (2012) discussed the relationship between products and services, and how they might meet the physical and service needs of customers. Another recent study focuses on determining a modularisation approach based on defining PSS functional requirements and how to divide them into different clusters to make customised design easier to meet individual needs.

To synthesise existing knowledge, we looked at how productisation has been characterised in the last decade (Table 1). The process of transforming variable, ad-hoc services and service products into concrete, well-defined service products, according to this review, is achieved by using specific approaches and tools. The primary features of productisation highlighted in the literature address the intangibility and lack of comprehensibility of many services, as well as standardisation, formalisation, systemisation, repeatability, configuration, modularisation, and bundling.

3. Study methodology

The methodology for the research paper was exploring the literature and other scientific references and applying them to the case study. The material used in the research paper is scientific literature related to productisation, services marketing, and product and service design and development. Accordingly, the purpose was to interview the research and development (R&D) and solutions unit director of the company. Additionally, studying the current processes and services (e.g. process descriptions and marketing material) and researching the outcomes of the productisation project is an important methodology of the study.

The methodology of the research was mainly qualitative, which comprises exploring the literature survey, the face-to-face interviews, and secondary data from the studied case company. The case company is situated in Finland and is engaged in consultancy in the energy business. As the company is engaged as a service provider, it was decided to study more within the company's premises and suggest several improvements based on the study outcomes. In the case of analysing past and present research, a rigorous literature survey was conducted in order to analyse relevant scientific references on various service models such as standardisation, productisation, modularisation, and automation. All such models were tested within the scope of the case company.

The study researches service standardisation, uses a case company as an example, and applies the explored theories to the case. In this way the study can raise problems with professional services in practice to support the theoretical research. The starting point for the study was a productisation project at the case company's R&D department. The case company is a technical consulting and engineering company specialised in providing professional services for businesses in the fields of energy, life sciences, manufacturing, information technology, and process industries. The company wanted to rationalise its sales methods and product portfolio; therefore, it started the productisation project.

In the case of the face-to-face interviews, several important personnel from the case company related to service activities were interviewed. Details of the interviewees, along with their job specifications and years of experience, are outlined in Table 2. From Table 2, it is noticed that most of the interviewees had over 10 years of experience and expertise in their respective jobs. The interviewees were mainly interviewed to know how their daily routines affect the service development of the case company. The user data collected during the interviews were analysed to determine how the company operates with the customer and guides the customer relationship within the case company.

In addition to the face-to-face interviews, necessary secondary data related to production, sales, and after-sales services were collected from the case company's databases. This data was useful in supporting the strategic analysis of the case company with respect to service standardisation, productisation,

Table 1. Service productisation descriptions, definitions, and essential dimensions.

Authors	Definitions and descriptions	Key enablers
Wirtz (2021)	Productisation entails more than just making services more concrete, standardised, and of higher quality.	Standardisation, servitisation
Grönroos (2020)	Although research on standardisation and service quality has focused on some aspects of productisation, it has not looked into how these standardised services could be 'packaged', marketed, and sold as object-like, well-defined service products.	Packaging, standardisation, servitisation
Elia, Gnoni, and Tornese (2019)	Customer happiness and perceived value of the offering are two major goals of service productisation. Standardising the service offering and introducing actual products and components are two ways to do this.	Standardisation, servitisation
Atasoy and Morewedge (2018)	A recent study has produced a variety of results when it comes to the perceived value of digital products and services versus physical products.	Systemisation, creation of digital product
Harkonen, Tolonen, and Haapasalo (2017)	Productisation also creates a level of formalization by systematising and tangibilising the service offering and related activities. In this case, formalisation could imply the standardisation of service components and processes.	Productisation, tangibilisation
Harkonen, Tolonen, and Haapasalo (2017)	Productisation is the process of analysing a need, defining and combining suitable tangible and intangible elements into a standardised, repeatable, and understandable product-like object.	Productisation, standardisation
Valtakoski and Järvi (2016)	Service productisation is a knowledge transformation process that takes place on two levels: from tacit to explicit, codified information, and from individual employee to organisational knowledge.	Knowledge productisation, tacit to explicit knowledge,
Andreini et al. (2015)	Moving from a service-dominant to a good-dominant logic, productisation aims to objectivise, standardise, and package services.	Objectivisation, standardisation
Aapaoja, Kujala, and Pesonen (2012)	Key outcome of productisation is combining offerings and delivery into well-defined packages so that customers' expectations are better met.	Packaging, identification of customer need
This study	The process of turning flexible, ad-hoc services and service goods into well-defined service products that are specified, branded, and priced to meet a specific client need is known as service productisation.	Specification, branding, productisation

Table 2. Number of interviewees and their expertise.

No.	Interviewee	Job specification	Year of experience
1	Research and Development Director	Innovation management	10
2	Production Manager	Product differentiation	14
3	Service Manager	Service differentiation	20
4	Sales Manager	Revenue management	15
5	Customer Service Manager	Customer support and well-being	12
6	Project Manager	Project monitoring	10
7	Marketing Manager	Market development	16
8	Solutions Unit Director	Problem identification and solving	12
9	Purchasing Manager		09

modularisation, and automation. Moreover, the case company's current processes and services (e.g. process descriptions and marketing material) and the outcomes of the productisation project were also studied within the scope of this research. The study methodology is presented in Figure 1

The case company uses the Capability Maturity Model (CMM) model as a base for developing its services. The CMM model is displayed in Figure 2. CMM is a tool for assessing and improving the case company's core processes for delivering a product or service. The model includes a path from immature processes to improved mature processes. It includes maturity levels that have certain goals. When the goal is reached the company is ready to pursue the next level. Each level gradually creates a foundation for the organisation to be able to climb up the levels. Figure 2 shows the levels of CMM.

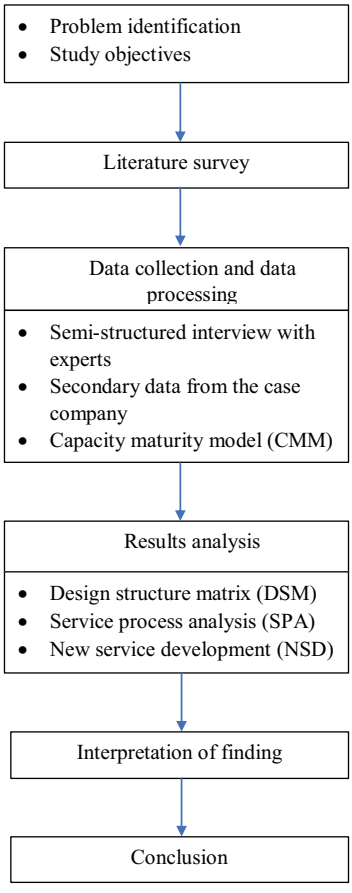

Figure 1. Study methodology.

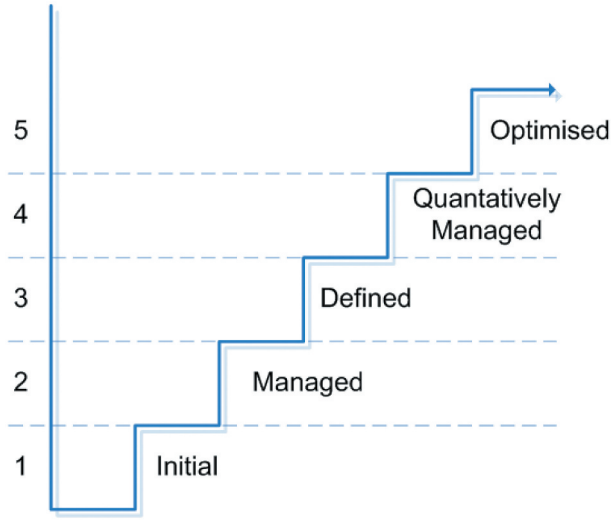

Figure 2. Capability maturity model maturity levels.

The levels of CMM are presented in the following:

(1) *Initial*: no systematic process exists and the processes are not under control; therefore, success in providing the services depends solely on the employees' competence, i.e. an ad hoc process
   a.Case company: selling resources
(2) *Managed*: the process is managed and management processes are established
   a. Case company – projects and project manager role established
(3) *Defined*: standard processes are defined and documented; there is consistent process improvement across the organisation, and more proactive process management
   a. Case company – service concepts established
(4) *Quantitatively Managed*: measurable processes with quantitative objectives (quality and process performance) are used for guidance in process management, statistical analysing; process performance is under control
   a. *Case company* – the aim
(5) *Optimised*: continuous process improvement is based on statistical data (quantitative and qualitative), and the focus is on 'managing and improving organisational performance'.
   a. *Case company* – the future

In order to create a modular service platform, a design structure matrix (DSM) tool was used. The DSM tool is used extensively to design modular products and services design. It is applied in product family design (Yassine 2019), healthcare services (Zhang, Gu, and Jahromi 2019), product architecture (Shamsuzzoha et al. 2020), and system architecture (Sinha, Han, and Suh 2020), and the construction industry (Zhong, Tang, and Chen 2022). In addition, this tool helps to offer services in a modular format that facilitates the customisation of services (Wang and Luo 2021; Mollajan and Iranmanesh 2021; Benjamin et al. 2022). This module format of services is also easy to handle and manage, which promotes higher customer satisfaction.

This study also uses the Service Process Analysis (SPA) model, which is considered a strategic normative model and is used for analysing efficient service positioning (Bask, Tinnila, and Rajahonka 2010). In SPA, the trade-off between production and transaction costs is used to establish the most efficient matching of services and channels. The SPA model provides a tool for the graphical representation of service positioning, as well as the evaluation of various repositioning tactics. It explains how to integrate the service's delivery channel (type of channel) with the type of service (type of service) (Tinnila and Vepsalainen 1995).

In order to automate the service process, this study considered the New Service Development (NSD) innovation matrix that determines the design of the service delivery system (Johnson et al. 2000). This matrix compares the industrialisation level to the standardisation of service offerings in any company. The industrialisation level indicates the ability to replace people with technology and systems in service creation, that is, the level of customer contact needed.

4. Description of the case company

The case company sells/offers customised specialised consultancy services for businesses. The offered services can also be called Knowledge-Intensive Business Services (KIBS). The customers are mainly industrial companies acting, for example, in the fields of energy/power, telecoms and information technology, and process and manufacturing industries. The content of the service and the service process is created and possibly partly designed for every customer individually according to the customer's needs and wishes. The services are under contract and can be an ongoing service or a service where a customer orders the service separately every time, or a project.

The services are many times bought from the case company as outsourcing services, that is, the customer has previously had employees doing the job that they now want to buy from outside the company in order to concentrate on their core competence. The output of the services can be a physical product or some kind of service that the case company is performing for the customer. The actual output of the service is usually under the customers' brand, and usually very specific instructions need to be followed regarding the contents and looks of the output product. The performing of the service usually requires close co-operation with the customer, or at least customer input.

4.1 Productising services at the case company

The productisation project aims to define and describe the current service products of the company. More specifically, to identify and create service concepts and service solutions, and modify the service portfolio. Additionally, to create sales, marketing material, and concept and service descriptions for selected pilot services. The key target for the project was to give better sales arguments with the help of the service concepts and help the sales team understand the services better. The target was reached at a satisfactory level; the concepts, service solutions, and services have been communicated to the sales department.

The productisation project was started because of challenges of selling and managing the service portfolio. In the past, the company has been selling largely resources and know-how without thinking about the overall solution. In addition, the sales personnel and the employees have not had a full understanding of the entire service selection and knowledge in the company. This has made sales and service portfolio management complex. The overall complexity of the services is the consequence of growing the turnover and market share by selling anything the customers have asked for and selling resources. This has led to an unclear service portfolio and customer-specific and complex services. In addition, the service development is decentralised in different units, which has made the service development inconsistent.

4.2. Standardising a service at the case company

The company has researched that service concept B has a lot of market potential and business to obtain. The service has been identified as having many potential customers since problems in the area that the service responds to have been noticed within many companies. Tis even a lot of business to win in the present customer companies. Currently, the engineering and consultancy service within concept B is a very customer-specific and customised service. This is a problem for marketing and sales since the service is difficult to sell and construct for other customers. This is because the company has difficulties in defining the core aspects of the product; in a way they do not know what they are selling. Therefore, the service needs development, and a productised service is essential when attempting to grow and sell the service to new and existing customers.

Based on the requirements, this study, therefore, considered a productisation project at the case company, dealing with concept B. As previously stated, concept B deals with the delivery of process engineering and consultancy services, which concentrates on developing the framework for the research and the context where the models are designed. The key concept is standardising services with customer benefits and values. Models for service standardisation are developed for the basis of further development regarding the productisation project. The context is presented with the overall service architecture, which follows by identifying modules, modular service platforms, and service automation.

4.3. Service concepts at the case company

The basic concept related to the service concepts A, B, and C are the outcomes of the case company's productisation project. The target market for the services of the case company

consists of the industry sector, more specifically industrial companies operating in the energy, life sciences, process, and information technology industries. In this context, the value chain in the industry sector consists of component and device suppliers, system suppliers, EPC contractors, consultants, constructors, and end-customers who are acting as operators and doing the service and maintenance. These segments were identified according to this value chain. The company constructs a value chain consisting of the R&D process, delivery process, and maintenance process, as shown in Figure 3.

At the beginning of the value chain, the component and device suppliers and system suppliers need R&D process related consultants and engineering services (concept A). The EPC contractor needs delivery process-related services (concept B). Finally, at the end of the supply chain the consultant or constructor and end-customer need maintenance process-related services (concept C). All of these services are created from modules, which are illustrated in Figure 4 as legs of the concepts. These concepts are visualised in Figure 4.

4.4. The overall service architecture at the case company

The overall service architecture at the case company was built as an example to show how market-focused platform thinking can be applied. The overall service architecture integrates the target markets: market-focused service platforms and the competencies, technologies, and skills of the case company together. The architecture is market and customer-oriented, with each service platform focusing on a market segment with specific goals and needs and enabling product-specific customisation. The overall service architecture of the case company is presented in Figure 5, and it is based on the integrated markets, platforms, and competencies model.

From Figure 5, it can be seen that the markets and market segments are two-dimensional grids that are situated in the upper part of the figure. When implementing the model for the case company, the columns in the grid present different industry sectors such as energy, life sciences, process, and IT, while the rows present the company's operations, namely the R&D process (producing serial products), delivery process (delivering customised products, i.e. every product needs customised design), and operation and maintenance process (operating the product).

The reasoning for the selected segments is based on the developed service concepts of the case company, which are developed and targeted for business companies located in specific parts of the value chain. Product platforms are situated in the middle part of Figure 5: in this case, concepts A, B, and C each represent a separate service product platform. The target groups for the platforms are pointed out with arrows. The focus of this research study is service concept B, which is designed to provide a solution for customer needs, goals, and problems in the market segment of the delivery process in the energy industry. This is marked in red in Figure 5.

The selling of services can be performed with a mass customisation idea. The service product is constructed of standard modules for customers according to what kind of product they are looking for, and the process is generated accordingly for the delivery of the service. The same modules can be used throughout different platforms; however, these modules have different characteristics according to the platform because the needs of the target groups are different. Product-specific customisation is usually needed for a customer because the services are usually tightly tied to the customer's product, processes, and operation in this area of engineering and consulting services. Therefore, a customer-specific configuration is usually needed for each product.

The competencies, technologies, and skills are situated at the bottom of the model, and also standard procedures, tools, and operations could be added there. These elements form the basis for the operation. For example, in the case company generic core operative processes and IT infrastructure form an essential basis for the operation. Competencies and skills are the company's biggest assets.

The usefulness and usability of the model in this case of professional services are the following. The model is focused on platform thinking; the services are assigned as platforms that form

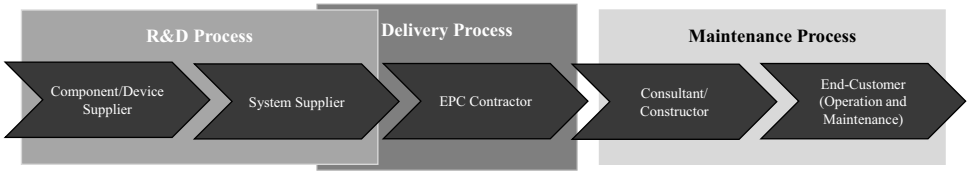

Figure 3. Value chain and processes.

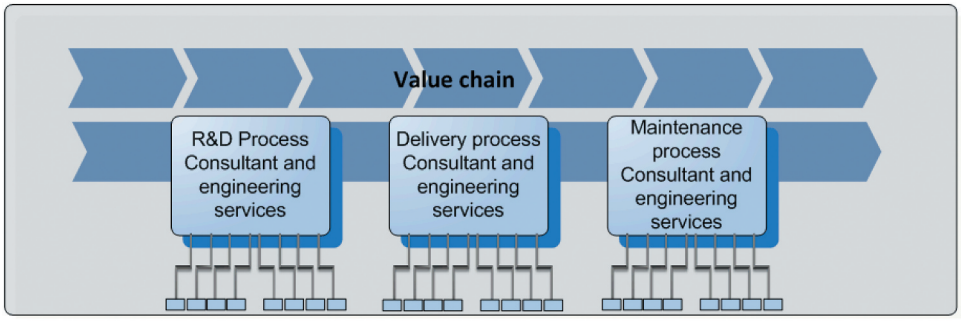

Figure 4. Concepts developed in the productisation project.

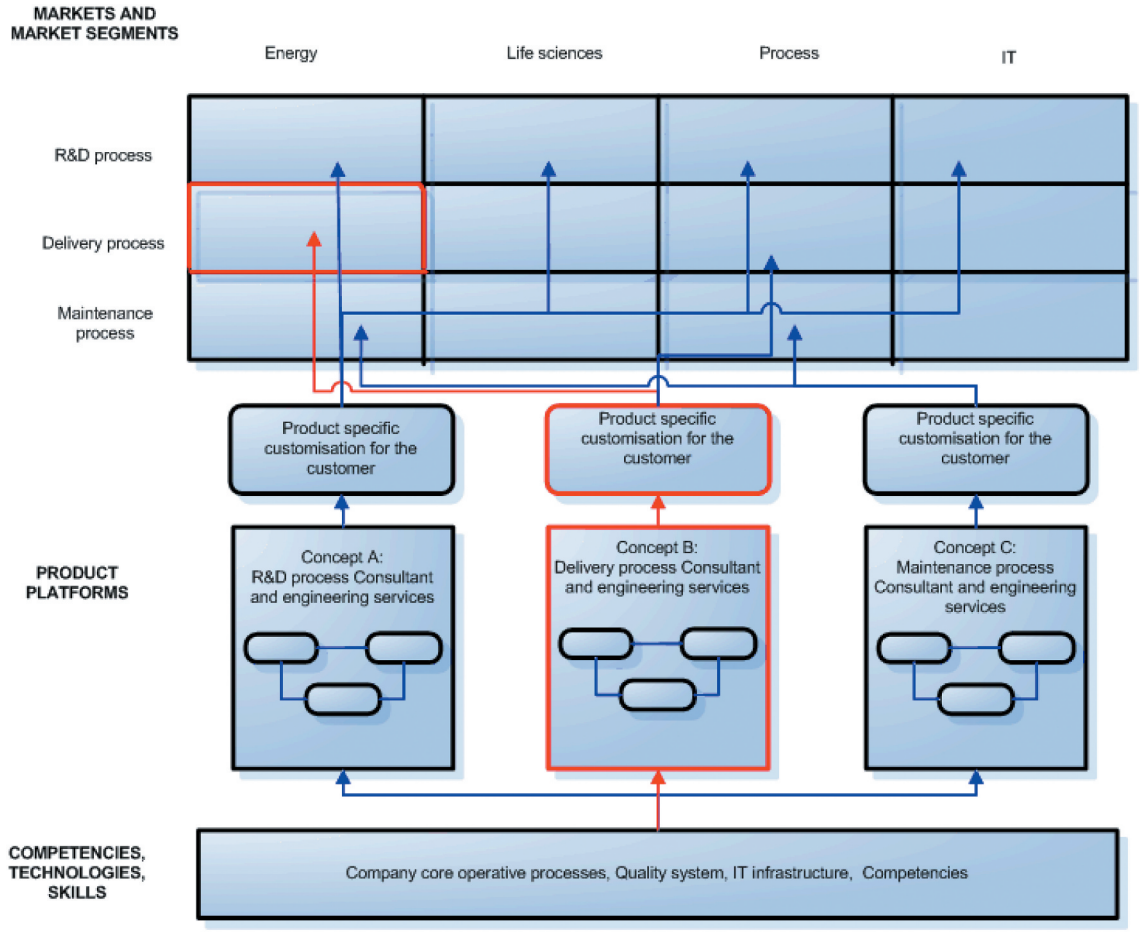

Figure 5. Example of overall service architecture for the case company.

the base for constructing service products of modules. The services are designed for continuous development and treated as products that differ from the current situation in the way that currently the services are developed for specific customer cases and when there is free time from customer projects. Therefore, the overall service development is not that strategic and planned. Additionally, the model has a market focus for using and developing the service platforms because the platforms are targeted and developed for the goals and needs of the defined market segments. The model also shows the overall picture of the platforms including modules and interfaces of the company, their target markets, and the customisation aspect.

5. Identifying the modules in service concept B at the case company

A heuristic method for identifying modules for product architectures and design structure matrix (DSM) was the selected alternative method for identifying the modules in service concept B. Of the two options, the Design Structure Matrix method was selected as the primary method because according to research it is complicated to identify the modules with heuristic modelling due to the complexity of the drawn diagram. However, heuristic modelling can be used as a secondary tool to assist DSM because a drawn functional diagram can be transformed into DSM representation; therefore, it is very helpful for creating the DSM.

Before identifying service modules for service concept B, a heuristic diagram of the service functions was modelled with the help of process descriptions (process flow charts and written descriptions) as displayed in Figure 6. The diagram displays various information flows, which include parallel, sequential, and coupled interactions. For instance, Task 2, 5, 6, 7, 8 and 1 are sequential, whereas Task 3 and 2 are parallel in nature. These interactions can be turned into matrix presentations for DSM (Shamsuzzoha 2010). A task-based DSM was constructed from the functional structure as presented in Figure 6, which was then clustered for identifying necessary modules by using a clustering algorithm. A group of tasks, that is, an activity, represents a module, which is the cluster in the DSM matrix.

Free software called Cambridge Advanced Modeller was selected for creating and analysing the DSM. The DSM is created by inserting the service elements, which are in this case service tasks, and their interactions in the DSM matrix. The interactions are inserted according to the input-output principle, that is, how the tasks interact with each other, and what tasks are the inputs and outputs for a task. After the DSM is created with the software, a clustering algorithm is used for identifying the modules in the service. The software automatically clusters the

matrix according to the defined interactions. In this way, the DSM representation shows the modules and interfaces between the modules. Figure 7 illustrates the created DSM matrix before clustering and Figure 8 illustrates the matrix after the clustering algorithm has been used.

Figure 7 displays all the tasks and their dependencies on each other through the DSM. The rows in the DSM represent the dependencies of tasks on each other, whereas, the tasks in the columns represent tasks that are required by other tasks to complete them. For instance, Task 4 in the row depends on

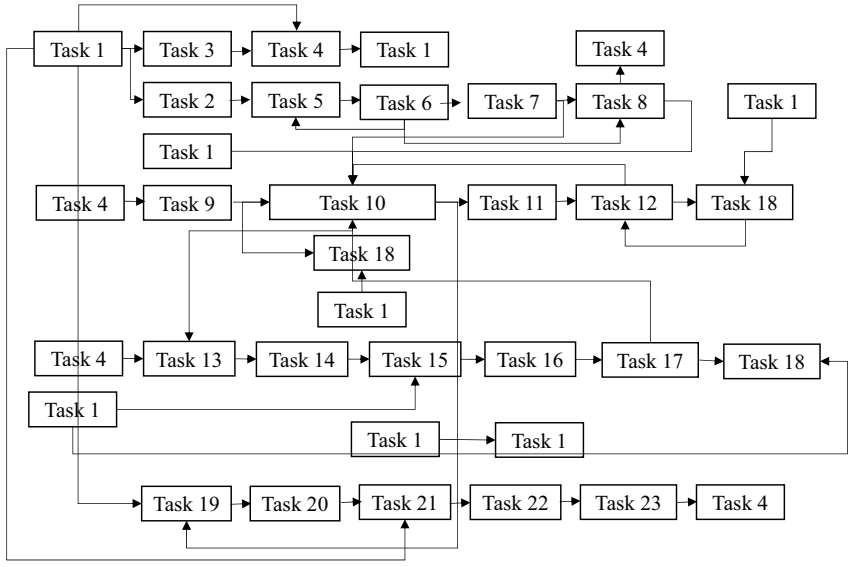

Figure 6. Functional structure.

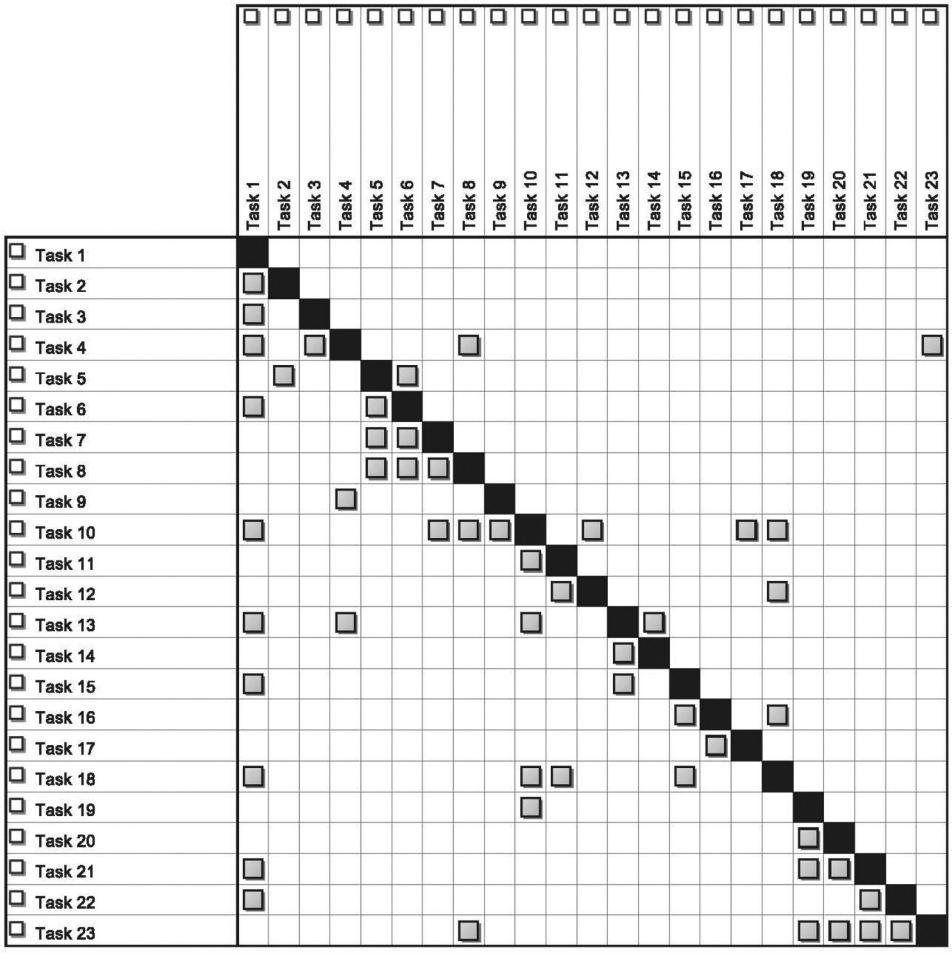

Figure 7. DSM matrix before clustering.

Tasks 1, 3, 8, and 23, whereas Task 4 in the column needs Tasks 9 and 13 to be completed.

Naturally, the software creates the clusters solely according to interactions, and it does not consider the functionality, business, and process-related factors. Therefore, at least, in this case, it is necessary to make some modifications manually with these latter factors in mind. When following the interdependence markings, it is possible to identify which tasks interact. It is possible to move the tasks that have an interaction closer to each other, and the software includes the task to a cluster automatically. For example, in Figure 8, Task 9 interacts with Tasks 4 and 10. Task 9 is currently situated in the same module as Task 4. When thinking about business, process, and functionality-related issues Task 9 is better situated in a module with Task 10. Therefore, Task 9 is moved to the same module as element 10.

Additionally, changing the sequence inside the modules as a lower diagonal was necessary in this case, such as in cluster 2. Also, cluster 6 was moved as a sub-cluster for cluster 5 because the sub-cluster does not exist without the main cluster. Therefore, the clusters are not interdependent. Additionally, the functions in the sub-cluster are not necessarily included in the service in every case and therefore should be a separate group. Figure 9 illustrates the modified version of the clustered matrix.

In the software, it is possible to transform the DSM view into a network view, which visualises the interactions between the elements as a sort of net. With the network view, it is easier to notice which are the most central tasks in the service (knots). For example, Tasks 10, 4, and 18 are central tasks in this case as displayed in Figure 10. Figure 10 visualises the dependencies of each task on each other. For instance, From Figure 10, it is seen that Task 22 depends on Tasks 1 and 22 showing an inward arrow, whereas Task 22 needs Task 23 to be completed, as displayed by the outward arrow from Task 22.

5.1 Creating a modular service platform for service concept B

The built empirical model provides an example of how the service platform could be constructed, points out what issues should be considered, and gives a base model on top of which the service could be further developed. The company has already developed the service concepts, product portfolio, and specifications for concepts in the productisation project. The modular service platform is constructed for services within service concept B as an example. The built platform for concept B includes the base block and modular service offering, modular processes, modular organisation, and modular customer interface. In this way the service can be mass-customised with the standard modules for customer-

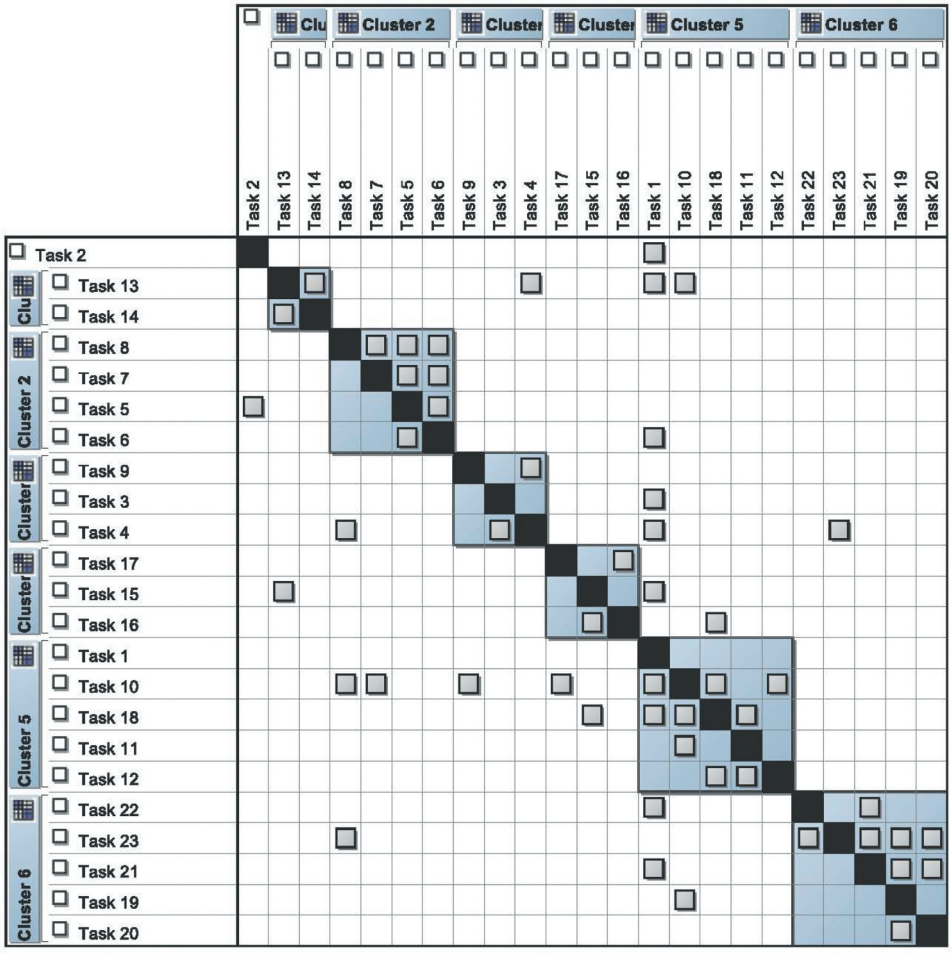

Figure 8. DSM matrix after clustering.

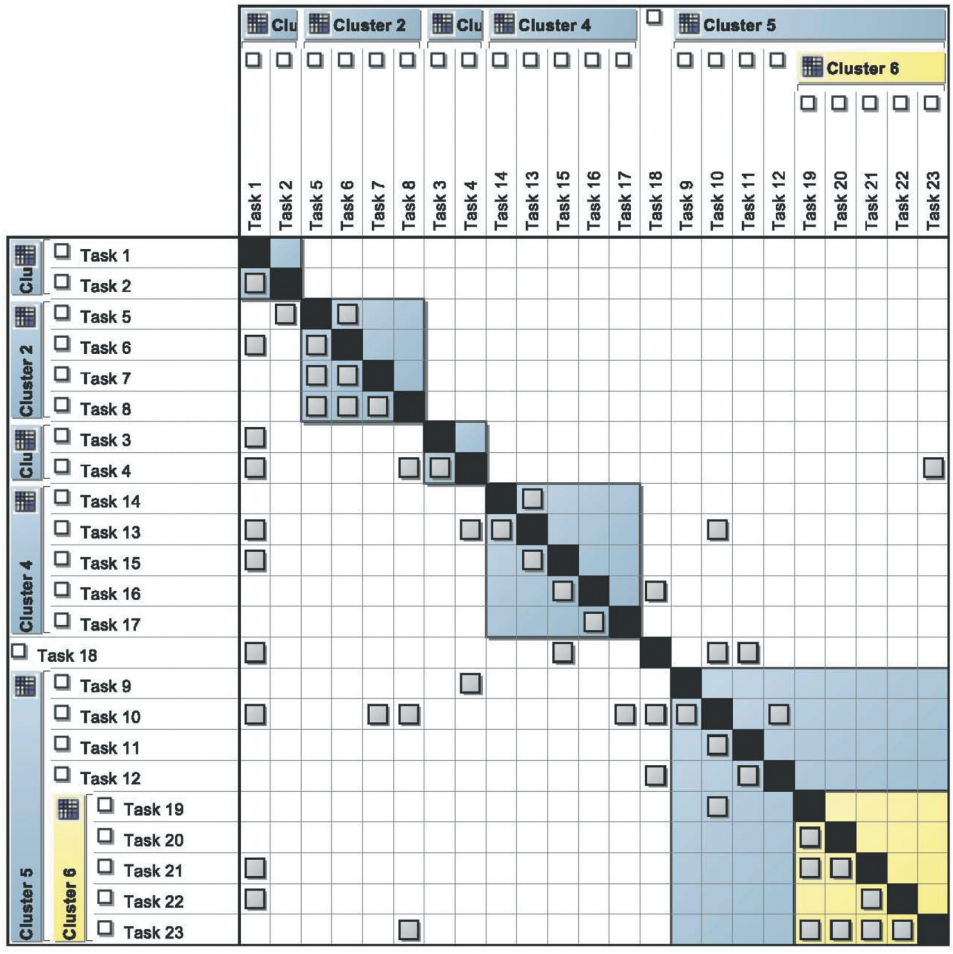

Figure 9. Modified version of the clustered matrix.

specific orders instead of customising the whole service. The built model shows how the service is delivered, which parts of the service can be constructed, and which parts of the organisation are involved in the service production.

5.2. Explanation of the modules and the platform

The platform is a common part, a block, on which the product can be structured from the selected modules. The interpretation of a platform is the following: the interfaces are communication, transaction of information or documents, that is, workflows. Interfaces determine how different modules (service, process, and organisation modules) are connected. The platform is the base on which the modules can be assembled. In services, this consists of tangible and intangible aspects. Tangible aspects could be the infrastructure enabling the work, such as technology, core operative processes, quality system, and organisation structure. Intangible aspects would be knowledge and know-how, special knowledge of the operational environment of the customer, and knowledge needed for service production. Therefore, the platform concept is abstract in the context of professional services.

Modules are built on the service platform according to the customer's order to construct a service. Modules are in a service perspective standardised activity groups, which are combined and built on the platform to construct a service solution. The model identifies more specific process and organisation modules, which are linked together, forming a kind of matrix showing what parts of the organisation are responsible for which tasks. The parts of the built modular platform model are displayed in Figure 11.

5.3. Automating a service

Currently, there are hardly any own tools for performing the service in the case company. That is why the case company is undertaking a project to develop tools or a tool for one service within concept B. The developed service is planned mostly with customers' systems, and even totally integrated inside the company's existing operational systems. The disadvantage of this kind of approach is that the case company is more selling resources rather than service products. Using the customer tools also limits developing the service in the direction that the case company wants; therefore, optimal service cannot be developed for the markets. In addition, offering the service to new customers is difficult without the technology. Without tools, there are merely processes, knowledge, and experience as an asset when selling the service. It provides customers having their own technology with producing the service. Better standardisation and mass customisation of the service can be guaranteed with the help of IT tools. Tools ensure the successful productisation of the service. In

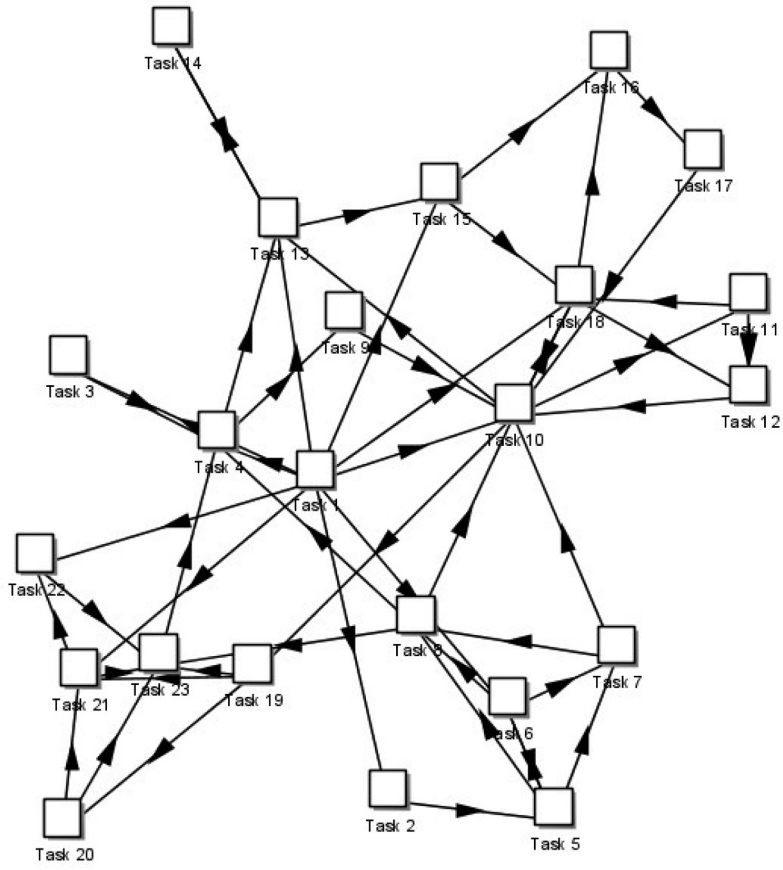

Figure 10. Network view.

addition, the company is enabled to offer cloud services, which would be a new kind of service model.

The New Service Development (NSD) innovation matrix as presented by Johnson et al. (2000) supports the level of customer contact that determines the design of the service delivery system. That is, services with a high level of client engagement should be customised, and services with a low level of customer contact should be standardised. The model connects service design with innovation. The model's level of industrialisation refers to the model's ability to substitute humans in service creation with technology and processes, i.e. the amount of customer contact required.

The current service of the case company would be located on low standardised face-to-face delivery in the NSD matrix (actually not face-to-face, but service delivery includes a lot of communication with the customer). Figure 12 shows the location of the current service in the NSD matrix in the top left corner. From Figure 10, it can also be seen that when the service in the case company is technology-driven, its industrialisation level is medium, where telephone or courier delivery is possible. At this phase, standardisation of service offerings is better than face-to-face delivery. In the case of high industrialisation and standardisation levels, the service components in the case company offer technology-based self-service, as also displayed in Figure 12.

The development team has identified a process assessment of four service modules that are possible to industrialise more with information technology. Therefore, the standardisation of the service could be realised by standardising the service modules. It is possible to shift some parts of the service to a more standardised and industrialised service. Some modules of the service can be turned completely into highly standardised technology-based self-service. When bringing this new tool to the service, the process is more standardised, but the actual service remains customised. This is shown in Figure 12 as technology-driven service innovation.

A comparable model, dubbed the service process analysis (SPA) matrix, is presented by Tinnila and Vepsalainen (1995). The matrix's core concept is to determine the most efficient mix of the type of service offered and the type of delivery channel that contributes to efficient service processes. That is, the most efficient service process is determined by choosing the best combination of channels and service kinds based on the cost of transaction versus the cost of production. The model aids in the positioning and repositioning of existing services of the case company.

To have the optimal service process of the case company, the service should be situated on the diagonal of the SPA matrix, as displayed in Figure 13. Figure 13 displays two dimensions of services, namely type of services and type of channels. There are four types of services, namely contingent relationship, customised delivery, standard contract, and mass transactions, and four types of channel, namely internal hierarchy, agent/alliance, service personnel, and market network. When placing the service to the SPA matrix, the service modules would be transferred from the adaptive process as a more standardised fast routine process by bringing an IT tool to the service creation. Even though the relationship with the customer would be a partnership relationship, which is

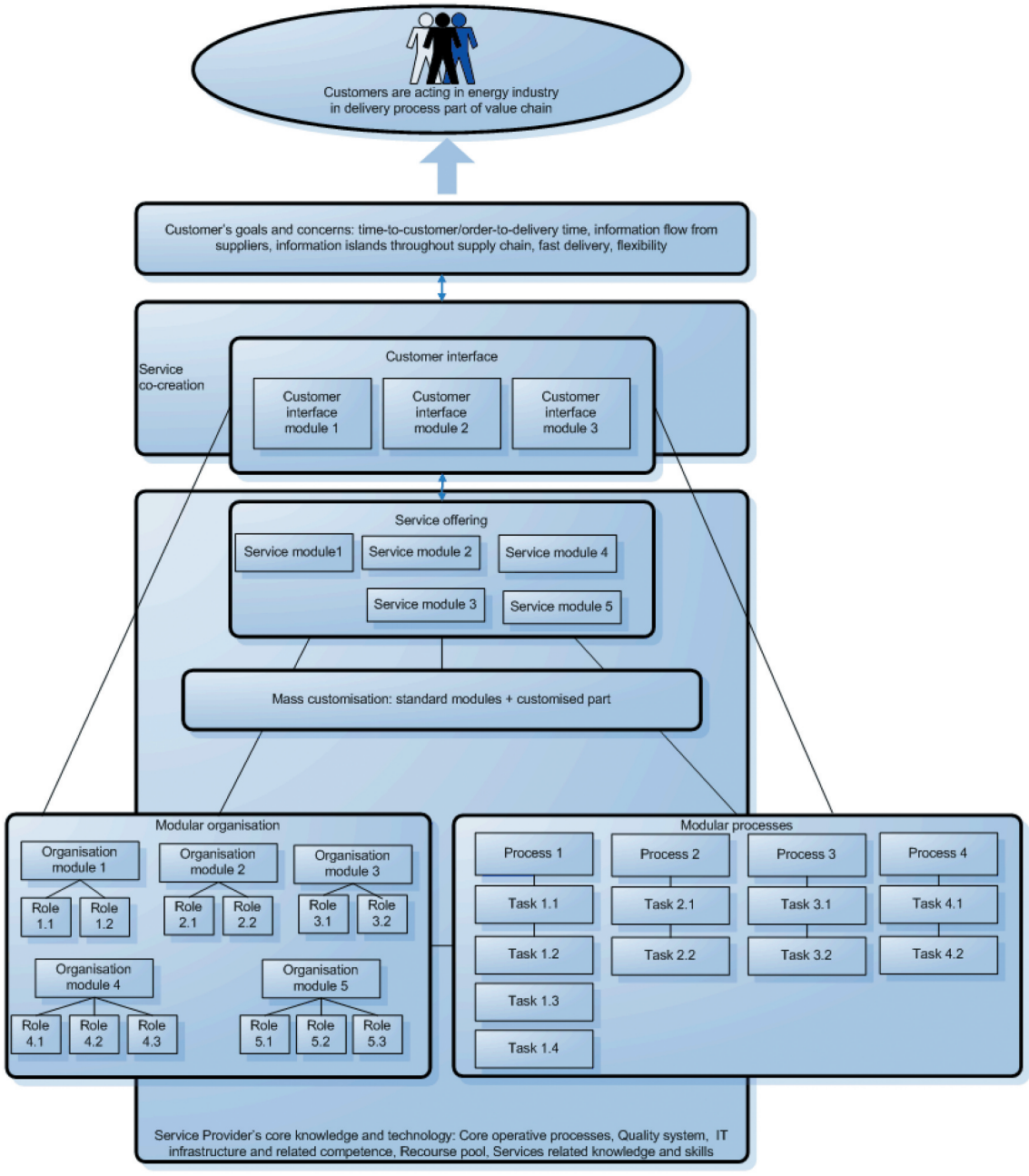

Figure 11. Modular service platform for concept B.

classified into an adaptive process, the production and transaction costs during the service process delivery would be smaller because parts of the service would be fast routine processes, as displayed in Figure 13. This means that the service remains as adaptive, but parts of the service are fast routine processes. Therefore, the production and transaction costs decrease.

Automating the service more could bring the following benefits: everything is visible in the system so customer contact is decreased, which means a decrease in transaction cost. In this case, the level of standardisation of the service delivery process is increased, which means a decrease in production cost. Increasing the industrialisation level makes service delivery faster and more agile, and brings better visibility and traceability. The process overall is better under control. Probably more business from current customers can be secured. Additionally, IT tools would bring more business opportunities for the case company for service concept B.

6. Discussion and study outcomes

6.1 Modularisation and standardisation of the service concept in the case company

Standardisation and modularisation bring added value for the customer: first of all, because the company can offer solutions designed for identified customer needs in the market segments. Secondly, there is no need to analyse and design the same service sub-areas over and over again ss nowadays similar service sub-areas are analysed and designed in repetition throughout projects for different customer companies. Additionally, the operation in

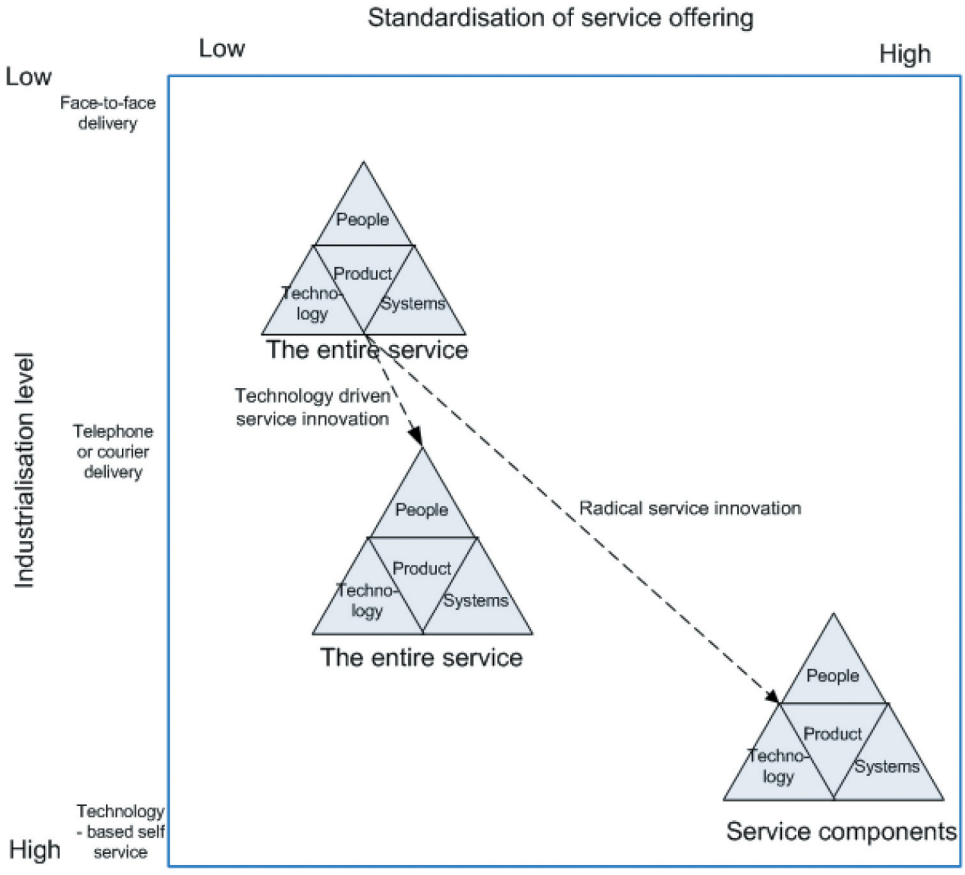

Figure 12. NSD matrix for a case service.

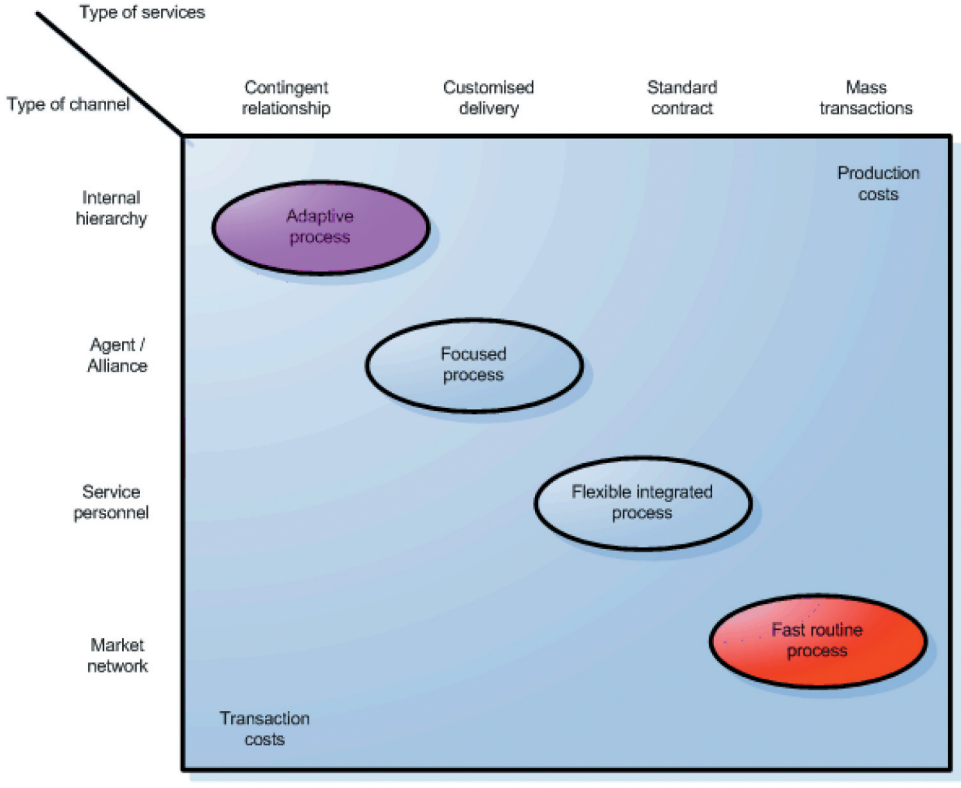

Figure 13. SPA model for case service (Pink colour = position of the entire service, Red colour = position of service modules).

the case company is standardised, regardless of the business unit. Currently, the service is very different for different customers. Standardisation also brings measurability, which makes comparison between the customers possible (benchmarking), and it helps provide development for their operation and even business opportunities for the customer. Measurability helps assure the customer that the case company's service is cheaper than the customer's current situation.

Standardisation and modularisation enable flat-rate pricing, which can be used in two ways: firstly, the standard service offered to the customer with a specified service content has a price, and if the customer wants to customise the contents, the price will be adjusted accordingly: that is, the customisation has a price. Secondly, the service is sold at a fixed price, and the more standardised parts the case company can use the better is the margin. In addition, standardisation also enables benefit-based pricing. This means selling solutions to the customers, where the pricing is based on the increased value for the customer and not on cost-based or market price. This approach should enable higher pricing. This notion is related to the above-mentioned measuring: when standardisation enables measuring, the company can prove to the customer how much in euros their business benefits related to their current situation.

Marketing and selling of the service in the case company are easier because there is a clear product that can be presented to the customer instead of marketing intangible solutions as currently, which is more abstract. Also, in sales situations the service can be mapped for the individual customer need of standard modules, that is, mass customisation. Additionally, if using a modular service platform idea, the sales department? understands which parts have to be customised. In addition, the salesman can see which parts of the organisation the issues affect, and who is responsible for the service. These things that will help the sales will also help the organisation, because the salesman can define and ask the right things. The problems afterwards with the actual service delivery are reduced. Additionally, standardised services help in budgeting service offers.

6.2 Sustainable impacts on performance

Applying modularity in service architecture and design is a good way to increase cost efficiency and performance. The following summary of possible benefits related to performance with the case example is discussed. The standardisation of the service makes the service more tangible, which facilitates selling the service. In this way the market share and revenues increase. Additionally, establishing the service for the customer is estimated to be quicker when using modular service than at present, therefore set-up time decreases. There are standardised procedures for establishing the service. Additionally, standardised services give better reasons for the higher pricing of customisation in products. Frequently highly customised services might be sold at a profitable price, although companies often do not realise that a high customisation level brings more work to controlling and managing the whole organisation.

When the structure of the service is more standard, workforce rotation is easier to effect, which enables more flexible capacity. Dependence on single workers diminishes. Also, it is easier to outsource work due to standardising and modular structure. Additionally, the quality is more consistent because the production is more standard and homogenous. Work satisfaction can also increase due to modular work because working more with a team work method rather than alone can give more motivation to the employees. Also, job rotation often increases satisfaction.

Additionally, standardised services increase the company's knowledge and competence. Nowadays, a lot of the knowledge and competence is very customer-specific, which prevents the company increasing its competence related to the service: it is customer-specific competence. This new approach could enable the development of a standard service and attaching the customer-specific customised part to it instead of extensively customising the whole service. This could ensure the development of an optimal and more competitive service.

7. Conclusions

Professional services should be able to respond to varying customer needs. Very often, service companies are trying to increase revenues by selling everything the customer wants. This kind of operation many times leads to increased service complexity. Custom-designed services bring complexity to service design and operation within the entire company's perspective. Overall control and service development of these services is challenging. In addition, selling the services is challenging because of their intangible nature. Standardisation and modularisation of services are ways towards service development. Standardisation is the answer for decreasing complexity and increasing tangibility. Applying modularity in service architecture and design is a good way to increase cost efficiency and performance. Standardisation of the service makes the service more tangible, which facilitates selling the service. In this way the market share and revenues increase. In addition, establishing the service for the customer is quicker when using modular service than at present, therefore, set-up time decreases. There are standardised procedures for establishing the service. Additionally, standardised services give a better reason for the higher pricing of customisation in products.

In this study, ideas about modularisation, mass customisation, modular service platforms, and service automation are used to discuss the standardisation of services. The study examines service development models associated with these topics and puts them to use in a professional services case study from real life. It makes suggestions regarding the types of models that can be used for engineering and consulting services. The productisation initiative in the case company is related to the case example. The three developed service concepts -R&D, delivery process, and operation and maintenance process engineering services – are the most important output from this study.

The delivery process engineering and consulting service idea serves as the foundation of this study. The biggest issues the company has had with services include difficulties in selling abstract services, the services being too customer-specific, and even the staff not understanding what the company is providing. Operating in silos is the result of this. The majority of service development has taken place within distinct business units and with distinct clients; as a result, the total service development has not been carried out very methodically when following the strategy. The difficulty is in turning the current customer-specific offerings into generalised standards.

Based on the scientific research in various publications, articles, real-world interviews and conversations with the director of the solutions unit and the R&D manager, as well as information from productisation projects, several models were developed to improve the productisation of services in the case company. The developed models are summarised as follows:

o An integrated model: This model deals with integrated markets, platforms, and competences to demonstrate how to combine the target markets, product platforms, and the technologies and competencies of the case company. To guarantee the case company's growth and competitiveness, all of these factors are necessary. Each of the service concepts developed as part of the example company's productisation initiative was found to correlate to a particular product platform notion.

o Design Structure Matrix (DSM): This model is used to identify the modules in a good or service. By adding the components and their interactions to the matrix and running algorithms on it using software, modules are found. The matrix was used in this instance to identify example modules of an overall service sold to a client.

o Modular service platform: This is a model for building and providing a service with a mass customisation approach. By building a service platform and attaching the indicated modules to it, the model is applied to the case. The paradigm enhances service provision, business operations, organisational structure, and client interaction via modularity.

o Matrices for service development: This model integrates both the NSD innovation matrix and SPA matrix to consider the customisation versus standardisation dilemma of services and offer ways of finding the most suitable service delivery process. This model is discussed within the context of case service automation – for industrialising services to establish more cost-efficient and faster processes.

In the interviews with the director of the solutions unit and the R&D manager, it was also revealed that there are several advantages that the standardisation and modularisation of idea B will provide. For instance, selling more tangible services is simpler, more flexible pricing models are available, and measurable operations and processes may be developed. An additional advantage is the case company's increased service knowledge and overall improved service competence. Moreover, suggestions for teamwork and task rotation might boost job satisfaction. Furthermore, the projected effects of standardisation and modularisation on performance include shorter set-up times, more adaptable capacities, more consistent quality, lower manufacturing costs, and more reliability.

7.1. Limitations/Challenges and future research directions

Because services differ from goods, marketing them presents unique difficulties and necessitates a variety of marketing strategies. The difficulty of communicating, describing, and determining the customers' needs for intangible services makes marketing challenging. Before making a purchase, the customers cannot know the outcome with any certainty. Customers struggle to assess services and distinguish them from rival ones. As a result, service providers ought to work to make intangible services more tangible. Furthermore, it can be difficult to identify the cost per unit when pricing services. In addition, to summarise, the obstacles faced by service businesses include recognising customer wants and expectations, concretising the service offering, balancing a variety of stakeholders and delivery-related issues, and upholding customer commitments.

Furthermore, there are still limitations/challenges that the case company will have to face after completing the service standardisation. Firstly, in the future, the challenge is to be able to provide customised service in different ways to the present. The professional service company must balance between fulfilling customer needs and standardisation. The challenge with professional services is that the service should respond to customer needs, but when responding to every need the service structure and offering become too complex and this makes marketing, selling and buying more difficult. This has been one of the problems with the current service. Additionally, what has been identified as a problem still with these new concepts is that if the customer need is not the same as in the concept description, there is no defined way how to operate. In these cases, the productisation will not give much benefit because a consultant needs to be invited to discuss with the customer and the service will be tailored. Therefore, aligning customer needs with the service offering will be a challenge.

In future studies, research related to pricing and performance measurement is needed. This is to ensure reaching the next level in the service maturity model, which means having more controlled and cost-efficient processes. Pricing, especially related to flat-rate pricing and benefit-based pricing, ought to be further investigated. Standardisation enables flat-rate pricing, which, for example, gives possibilities for greater profit. Productised service is proof that the service is worth the set price. Additionally, the tool aspect is a very important part of ensuring the competitiveness of service concept B. A tool development project can be initiated to create software to enable the availability of software solutions to ensure the providing of full-service solutions for the customer and standardising the service.

Disclosure statement

No potential conflict of interest was reported by the authors.

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