

MASTER

Strategic business concept for transforming a product-oriented supply chain to a service-oriented supply chain

Vloet, T.W.M.

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Eindhoven, November 2015

**Strategic business concept for transforming a
product-oriented supply chain to a
service-oriented supply chain**

By

T.W.M. (Thijs) Vloet

BSc Mechanical Engineering Avans 's-Hertogenbosch - 2012

Student identity number 0819371

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in Innovation Management**

Supervisors:

Dr. Ing. J.P.M. (Joost) Wouters, TU/e, ITEM

Prof. Dr. A. J. (Arjan) van Weele, TU/e, ITEM

TU/e School of Industrial Engineering
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Abstract

Purpose: investigate by empirical explorative research what steps can be followed accompanied by capabilities and competences to organize a shift in the supply chain from product-orientation to service-orientation.

Design/methodology: the research was conducted at the company Alpha and the dealers of Alpha products by using a qualitative multiple embedded case study, accompanied with a literature review. The study focus was on identifying the product-service activities, underlying internal capabilities, and external support for product-service operations. Semi-interviewed were held at nine different companies with in total 29 people, archival company information was retrieved, and observations were held. The cases were analyzed by within-case analyses and compared by cross-case analyses.

Findings/results: a servitization framework was developed to guide the transition towards a service-oriented company at different levels of the supply chain. Variables were introduced and determinants found to describe the characteristics and capabilities to produce and present services to customers per sub stage on the continuum. In addition, a supply chain interface framework was developed and determinants were found to manage the product-service supply chain while being in a servitization transition. The data retrieved from field research in combination with the developed framework resulted in positioning of Alpha and dealers on the continuum.

Practical implications: five practical implications are developed for Alpha in order to start with making a servitization transition based upon the position of Alpha and eight dealer companies. The implications start with giving guidance on how Alpha can introduce the paradigm of interorganizational servitization to stakeholders and own employees, inspire them that this paradigm will solve many current business problems and give direction on how the product-service can be executed. After that, it will specify how the supply chain should be reconfigured or made ready for servitization, how the first determinant on servitization success can be accomplished, and what approach should be taken in accomplishing multiple determinants.

Theoretical implications: the developed servitization continuum in the developed framework is the first one to describe the transition in detail, with a clear non-disputable delineation among stages, and unambiguous constructs. Service offering characteristics and capabilities for service operations at each sub stage of the continuum are now linked with theoretical models of the strategic marketing planning cycle and the value chain concept of Porter. In the supply chain context of servitization, scholars should treat upstream servitization different from downstream servitization. Moreover, a framework is introduced for executing a servitization transition in an interorganizational (supply chain) context.

Preface

This master thesis is the result of the graduation assignment belonging to the educational program of Innovation Management at the Technical University of Eindhoven, the Netherlands. The assignment is executed within the company of Alpha to solve their challenge in transforming from a product-oriented to a service-oriented organization. I will wish everybody at Alpha the best in reaping the fruits from this transition for the upcoming years, by putting the solution and its accompanied tools into practice. As my own experience with the project and the risks and challenges with servitization, I would like to inspire Alpha and you by mentioning that nothing great was achieved without stepping aside the common benchmark and follow your true but sometimes tough destiny. In other words: *“behind challenges lay hidden paradises”*. This assignment would not have been accomplished without the support of others. Therefore, I would like to thank everybody for their help and in particular the following people:

Firstly, I would like to thank my first university supervisor Mr. Joost Wouters for his critical attitude, feedback, sharing of thoughts on servitization, and inspiration to accomplish this assignment in majority by following my own vision.

Secondly, I would like to thank my second university supervisor Mr. Arjan van Weele for his feedback on connecting this master thesis with the latest research on supply chain management.

Thirdly, I would like to thank my colleagues at Alpha and in particular the people at the department of export and my company mentor for their feedback and support on my research, describing the peculiarities at Alpha, and the assistance in finding the way through all company information.

Fourthly, I would like to thank the respondents at Alpha dealers for their interest, participation in interviews, and provision of company documents to describe their case situation, and develop solutions for their problems.

Fifthly, I would like to thank my parents, brother, sister, and girlfriend for their support, feedback, patience, space, interest in accomplishing this report, the ideas on shaping the structure of the report and keep me looking at the overall picture of the assignment

Sixthly, I would like to thank my friends for their welcome assistance in developing some frameworks and reasoning behind methodological decisions. Although doing research has many struggling, it does always gave me energy to move forward after having made some jokes and laughing about the most serious topics.

Thijs Vloet,
Eindhoven, November 2015

Management summary

1. Introduction

Historically, customers did buy mainly products from which they were never certain about its performance over life time, the total expenses on service and maintenance, and other risk factors that played a role while buying a product (Slack, 2005). Customer satisfaction could therefore not completely be fulfilled. Recently, companies have acknowledged that enhanced customer value can be delivered by the means of servitization. This has led to an emerging trend of selling integrated product-services (Kindstrom & Kowalkowski, 2014). While in service dominant logic goods still have an independent proposition to the customer, are in servitization processes only services sold and have goods a supporting role (Baines, Lightfoot, Benedettini & Kay, 2009). Nevertheless, there is yet a scarcity of companies that successfully have implemented this concept. Studies have shown many hurdles that occur with servitization processes. There is lack of belief and encouragement in the paradigm by top management, lack of organizational capabilities allied to producing product-services, and an organizational cultural bias focused on selling products instead of services (Kastalli & Van Looy, 2013). Even more, the dependency of companies on third-parties will remain in a servitized environment. Davies (2004) highlighted that the major challenge for product-service companies is to acquire the capabilities and competences to integrate the value adding contributions of third-parties in an integrated solution of products and services. Consequently, servitization implementation is not only limited to internal, but also external alignment (Matthyssens and Vandenbempt, 2010). In the past, transition models are developed for making a gradual transition on the continuum by identifying and specifying different stages on the continuum from selling goods to selling services (Oliva & Kallenberg, 2003). Even though these proposed solutions are validated to be successful and some of them get more credibility than others does none of them clearly dominate. Moreover, there is a wide range of inconsistent terms used in literature related to servitization (Lay, Schroeter & Biege, 2009). Literature also neglects to explicitly highlight the service characteristics and company capabilities of each stage (Martinez, Bastl, Kingston & Evans, 2010). There is therefore no uniform strategic servitization concept that is all-encompassing. In terms of managing the product-service supply chain, there is yet more attention to the supply chain network as an important support element in providing product-services (Finne & Holmstrom, 2013). However, there is yet no strategic concept for managing a product-service supply chain, and to what extent service characteristics and capabilities are equal for each supply chain company. Even more, there is yet no bridge that connects intra and Interorganizational servitization (Brax, 2005; Auramo & Ala-Risku, 2005).

Intraorganizational servitization is further defined in this study as transitioning to a service-oriented company for a single independent operating company. Interorganizational servitization is defined as transitioning to a service-oriented company for multiple interdependent operating companies in the supply chain.

Alpha B.V. is currently struggling with Interorganizational servitization. Alpha is a multinational company with over X years of experience in providing integrated solutions on product W, ventilation and product Y. Alpha has recently identified that some dealers are becoming dissatisfied in the current product portfolio, which is a representation from end customer needs. End customers place more value on how they can enhance the performance and happiness of people, and health and energy efficient regulations in combination with modern building concepts are stimulating the use the latest technologies. Besides external demands, Alpha has set strategic goals to expand and professionalize the dealer network. Alpha believes that introducing several product-services targets could be met (Alpha, 2015). Although Alpha is aware of the need and value of product-services, they have no clue in what order they should be introduced, how they can be priced, and how they should be sold. They are therefore subject of investigation. This leads to the following problem statement:

“Alpha lacks insight in what and how to deliver and improve customer performance by making a transition toward product-services within and across a group of companies in the supply chain.”

The main objective of this research study is to close the theoretical and practical gaps by developing a detailed staged servitization framework that enables a group of companies in the supply chain to make the transition from a product-organization to a service-organization. The following research questions are set apart to answer the main objective:

- ◆ RQ 1: What theoretical models or combination of models are present for traditional manufacturing organizations to make the shift to a more service-oriented organization?
- ◆ RQ 2: What theoretical models or combination of models are present for traditional manufacturing supply chains to make the shift to a more service-oriented supply chain?
- ◆ RQ 3: What is the current position of Alpha and its dealers on the product-service continuum and on the supply chain?
- ◆ RQ 4: What is the desired position of Alpha and its dealers on the product-service continuum and the supply chain?
- ◆ RQ 5: How should interdependent companies (Alpha and its dealers) make the transition on the product-service continuum from an interorganizational viewpoint?

2. Research methodology

To answer the research questions is a two-fold methodology chosen. Firstly, a systematic literature review will be conducted that contains the two main topics: in-depth knowledge will be retrieved about conceptual models that guide organizations successfully along the servitization continuum and it will be identified how supply chain management is performed for product-service organizations or while being in a servitization transition. From this point on, a new framework will be designed that extends the traditional servitization continuum referred to Oliva and Kallenberg (2003).

The second part of the research is persistent on obtaining empirical data from current business practice around Alpha and its dealers to adapt and fill up the gaps in the initial theoretical framework. The first main unit of analysis is Alpha with the subunit Alpha. The second main unit of analysis is the distribution network, and the subunits are the distribution dealers of Alpha. Semi-structured interviews are held

together with seeking for archival company information and observation. A within-case analysis as part of the case study will be used to position each subunit on the new theoretical framework, and a cross-case analysis will be used to identify the differences and similarities between subunits by comparison (Beverland and Lindgreen, 2010). After adjustment of the theoretical framework with empirical evidence, one of the respondents of each distribution dealer is asked for giving feedback in a meeting to validate the adjusted framework. The concept will have theoretical and practical relevance if it could answer question three, four, and five of the research questions.

3. Results

The first part of the study resulted in an initial theoretical framework to guide the servitization transition at an intra- and interorganizational viewpoint. Variables were introduced and determinants found to describe the characteristics and capabilities to produce and present services to customers per sub stage on the continuum. In addition, a supply chain interface framework was developed and determinants were found to manage the product-service supply chain when being in a servitization transition. This interface consists of two elements: the supply chain configuration that should settle any relationship between two companies, and the supply chain relationship management channels that could be used to strengthen the relationship after settlement.

The within-case analyzes revealed detailed information about service operations and characteristics of case companies. The cross-case analyzes of this information resulted in validation of the determinants in the framework and broadening of the framework with new determinants. The results revealed four different types of services and accordingly a new variable of productive services was added to the framework. Furthermore, new knowledge was found that could improve the execution of determinants and solve current problems at Alpha. The data retrieved from field research in combination with the developed framework resulted in positioning Alpha and dealers on the continuum for their current and future status.

A feedback session was held with respondents to validate the improvements made for them based upon collected data. Some adjustments were made to the framework from the feedback session. Here after, all respondents could identify themselves on the framework and did they feel pleased to implement the solution to their own organization.

4. Conclusions

It can be concluded that traditional product-oriented companies up- and downstream can make a shift towards a service-oriented company, by using the universal theoretical framework as introduced in this report. This framework is an extension of the model of Oliva and Kallenberg (2003). Each sub stage on the continuum is accompanied with a set of determinants belonging to variables that should be developed in order to accomplish each stage. Consequently, research question one is answered. Furthermore, it can be concluded that traditional product-oriented supply chains can make a shift towards a service-oriented supply chain by using the supply chain interface concept as introduced in this report. This design is the first concept to create a connection between the two different fields of research. The design is composed of two elements: the supply chain configuration and strengthening of the supply chain relationships. Each sub stage on the continuum is accompanied with a set of determinants belonging to variables that should be developed in order to accomplish each stage. Consequently, research question two is answered.

In the current position does no company yet enters customer-oriented selling. On average, dealers are entering relationship-based selling. Alpha could be positioned equally to the average position of dealers and can therefore be marked as being operating in a reactive or exploitative mode. On the supply chain configuration, dealers and Alpha could be marked well in relation to the service offering and capabilities. The dealer's position on the management of the supply chain relationships in terms of the four flows is much under the expected level. Consequently, research question three is answered.

All companies except Zeta would like to go one step further on the product-service continuum. Some companies have a slightly higher ambition than others, what can be translated back to their historical or current position on the continuum. Alpha has high ambitions to servitize in future by moving almost two steps in the servitization continuum. Consequently, Alpha can be marked as being proactive and in an exploratory mode. On the supply chain interface, dealers are willing to move as well, but they expect to move not as much as with intraorganizational servitization variables, because they rely upon Alpha to move as well. Consequently, research question four is answered.

It could be concluded that the developed theoretical framework accompanied with the interpretation of current and future position of case companies should give guidance on how the interorganizational servitization transition should be made. Alpha as manufacturer was identified as the leading party in the supply chain for guiding the transition process of servitization. The first step is to turn the organizational Alpha culture from being exploitative to explorative or pioneering in servitization. The second step is to turn the supply chain culture from being product-oriented to service-oriented. The third step is to reconfigure and restructure the supply chain interface. The fourth step is to align internal characteristics of services and capabilities. The fifth step is to create a plan with stakeholders for aligning service practices within their company. The sixth step is to create a plan with stakeholders for aligning the position on the servitization continuum in the supply chain context. The seventh step is to complete future stages of the servitization continuum synchronically. Consequently, research question five is answered.

5. Contributions and recommendations

- ✓ The newly developed theoretical framework was applied to Alpha and eight dealers companies. The results show the current and future desired position of Alpha and its dealers on a wide range of variables. The recommendations plan, accompanied with an apart implementation protocol could be used as a guiding tool in getting control over current service operations, making a plan for new to develop services, and execute the plan by accomplishing the determinants or ingredients on each stage of the continuum.
- ✓ The new theoretical framework was developed to be used as a universal approach in transitioning from a product-oriented to a service-oriented organization.
- ✓ The newly developed theoretical framework showed that intraorganizational servitization is different from upstream versus downstream service suppliers. This has led to the development of a new primary supply chain for services, and differentiating between four types of services.
- ✓ The newly developed theoretical framework differentiates between supply chain configuration and supply chain relationship management for organizing servitization transitions in a supply chain context. As a result, it does form the bridge in linking the scientific research topics of servitization and supply chain management.

6. Recommendations for future research

- ✓ Further research should validate the findings of the first unit of analysis with more cases.
- ✓ Further research should investigate the lower upstream supply chain to get a more comprehensive image about product-service supply chains.
- ✓ Further research should find out how customers perceive the service offerings and to what extent the servitization strategy is applicable or should be adjusted.
- ✓ Future research with high level service companies could lead to new empirical evidence for new determinants that should complete the framework on later sub stages.
- ✓ A longitudinal study on cases making a servitization transition could validate the assumptions made from analyzing companies being in servitization mode.
- ✓ Further quantitative research could give insight to the importance of topics, variables, and determinants for affecting servitization success.
- ✓ Further research could broaden the cross-over knowledge between the two topics of servitization and supply chain management. It would be interesting to get more insight in the differences of procurement of services versus products, and the (dis)advantages of using a certain supply chain configuration for a service-oriented versus product-oriented company.

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List of abbreviations

Abbreviation	Definition
PSS	Product-service System
CoPS	Complex Products and Systems
SLA	Service Level Agreement
NSD	New Service Development
NPD	New Product Development
CRM	Customer Relationship Management

SRM	Supplier Relationship Management
EDLP	Every Day Low Pricing
4Ps	Product marketing mix: Price, Product, Place, Promotion
7Ps	Service marketing mix: Price, Product, Place, Promotion, People, Process, Physical evidence
SWOT	Strengths, Weaknesses, Opportunities, Threats
SME	Small & Medium Enterprise
CCO	Chief Commercial Officer
CFO	Chief Financial Officer
CIO	Chief Information Officer
ICT	Information and Communication Technology
DMU	Decision Making Unit
KPI	Key Performance Indicator
VAP	Value Added Partner (strategic relationship)
VAR	Value Added Reseller
B2B	Business-to-Business
CFD	Computational Fluid Dynamics
S&M	Service & Maintenance
ERP	Enterprise Resource Planning management system
TCO	Total Cost of Ownership
R&D	Research & Development
HRM	Human Resource Management
X	X
LSP	Logistic Service Provider
KAM	Kwaliteit, Arbo & Milieu
CMR	Convention on the Contract for the International Carriage of Goods by Road
EUR1	EUR1 MOVEMENT CERTIFICATE
X	X
BMI	Building Management System
FM	Facility Management contractor
VPN	Virtual Private Network

Table 1 List of abbreviations

1. Introduction on research study

1.1 Theoretical background

Vargo and Lusch (2004) describe the development of economic markets by four stages: commodity products, customized goods, services to increase the benefits of goods, and delivering customer experience or performance. Historically, customers did buy mainly products from which they were never certain about its performance over life time, the total expenses on service and maintenance, and other risk factors that played a role while buying a product (Slack, 2005). Customer satisfaction could therefore not completely be fulfilled. Recently, companies have acknowledged that enhanced customer value can be delivered by the means of servitization, which resembles with the last two stages. This has led to an emerging trend of selling integrated product-services (Kindstrom & Kowalkowski, 2014). While in service dominant logic goods still have an independent proposition to the customer, are in servitization processes only services sold and have goods a supporting role (Baines, Lightfoot, Benedettini & Kay, 2009). As such, customer needs will be fulfilled that happen beyond initial product adoption. This creates competitive strategic and marketing advantages, and financial benefits (Baines, Lightfoot, Benedettini & Kay, 2009). Services are more difficult to imitate and initiate long-term customer lock-in. Customer retaining costs are much lower and services add in diminishing adoption risks and increasing customer trust (Johnson & Mena, 2008). In financial terms, services do generally have higher margins and lead to stable and continuous revenue streams over a long term (Johnson & Mena, 2008). It will therefore be highly profitable for management practitioners to make a servitization shift. Nevertheless, there is yet a scarcity of companies that successfully have implemented this concept. Studies have shown many hurdles that occur with servitization processes. There is lack of belief and encouragement in the paradigm by top management, lack of organizational capabilities allied to producing product-services, and an organizational cultural bias focused on selling products instead of services (Kastalli & Van Looy, 2013). This has led to inhibition of the servitization transition or development of services that lack value or crucial organization capabilities (Neely, 2008; Matthyssens & Vandenbempt, 2010). Even more, the dependency of companies on third-parties will remain in a servitized environment. Davies (2004) highlighted that the major challenge for product-service firms is to acquire the capabilities and competences to integrate the value adding contributions of third-parties in an integrated solution of products and services. Although an integrated product-service solution is often offered by one company, the production and support tasks are often leveraged to a broad network of suppliers, called the supply chain network (Johnson, Scholes & Whittington, 2008). Lockett, Johnson, Evans and Bastl (2011) concluded that even though a single firm is convinced about the servitization transition, up- and downstream dealers and suppliers have their own incentives for producing and selling product-services. Because selling product-services requires another business model, this could affect the way a company interacts with its stakeholders and consequentially the configuration of the supply chain (Bustinza, Parry and Vendrell-Herrero, 2013; Lockett, Johnson, Evans & Bastl, 2011). Companies are dependent upon the willingness of others to move towards product-services (Windahl & Lakemond, 2006). Consequently, servitization implementation is not only limited to internal, but also to external alignment (Matthyssens and Vandenbempt, 2010).

In the past, transition models are developed for making a gradual transition on the continuum by identifying and specifying different stages on the continuum from selling goods to selling services (Oliva & Kallenberg, 2003). The continuum distinguishes purely products on the left side and purely services on the right side. When moving along the continuum, services will become more dominant. These type services meet peripheral customer demands indirectly related to the product (Tukker & Tischner, 2006). In case studies, this approach was further validated or extended (Baines et al., 2009; Matthyssens & Vandenbempt, 2010). Although Matthyssens and Vandenbempt (2010) use a matrix framework, the trajectory is similar. Even though these proposed solutions are validated to be successful and some of them get more credibility than others, none of them does clearly dominate. Besides that, it is not clear whether a transition should be executed gradually, following Oliva and Kallenberg (2003) or as multiple processes in parallel with matrix frameworks like the one of Matthyssens and Vandenbempt (2010). Moreover, there is a wide range of inconsistent terms used in literature related to servitization (Lay, Schroeter & Biege, 2009). Literature also neglects to explicitly highlight the service characteristics and company capabilities of each stage (Martinez, Bastl, Kingston & Evans, 2010). There is therefore no uniform strategic servitization concept that is all-encompassing.

In the product-service supply chain context, He and Lai (2012) concluded that closer interaction or bonds between supply chain companies should start at the moment a firm starts to transform to a product-service organization. Financial and operating risks can occur with demanding other type inquiries from network partners. They could be indicated, prevented or mitigated in an early stage of the transition (He and Lai, 2012). Therefore, offering an integrated solution of products and services is dependent upon the strength of cooperation between network actors (Slack, Lewis & Bates, 2004). In recent years, there is more attention to the supply chain network as an important support element in providing product-services (Finne & Holmstrom, 2013). However, there is yet no strategic concept for managing a product-service supply chain, and to what extent service characteristics and capabilities are equal for each supply chain company. Even more, there is yet no bridge that connects intra and inter organizational servitization (Brax, 2005; Auramo & Ala-Risku, 2005). Intraorganizational servitization can further be defined as moving to a service-oriented organization for a single independent operating company. interorganizational servitization can be defined as moving to a service-oriented organization for multiple interdependent operating companies in the supply chain.

Research is therefore inconclusive about intra and interorganizational servitization.

1.2 Business context

The research is carried out at Alpha B.V. during a graduation internship. Beta is a multinational company with a market leader position for over X years in providing integrated solutions on product W, ventilation- and product Y. Customers of Alpha are users of all kinds of building types. With its mission slogan is Alpha dedicated to deliver the best solutions to create sustainable climates. Its vision is to use product W in the most efficient way. Alpha employs over X employees divided by five subsidiary units. In other countries, Alpha has strategic dealerships and dealers to distribute their products. The functions of each company and its relationship in the Alpha network can be further studied in the organizational chart in appendix A and B.

1.3 Problem statement

1.3.1 Economic situation

Alpha has recently identified that some dealers are becoming dissatisfied in the current product portfolio, which is a representation from end customer needs. At first, end customers place more value on how they can enhance the performance, knowing that indoor climate quality is a major factor. Current products are mainly manually controlled, meaning that indoor climate quality cannot be sustained continuously. Secondly, energy efficient regulations are stimulating and directing architects and project developers toward high quality buildings with the latest technologies on saving energy. Thirdly, modern building concepts are becoming more complex systems in which all applications are seamlessly integrated and controlled continually. This leads to increasing project risk in making simulations and calculations.

Besides external demands, Alpha has set strategic goals to raise brand awareness, expand and professionalize the dealer network, and broaden the product portfolio. The current driver is to get customer intimacy by creating strong relationships with dealers and end customers to hold grip on an increasing competitive market with low product margins. In short, Alpha's goal is to sustain a differentiation strategy (Fahy & Jobber, 2012). This is even more imperative since the economic downturn has been ended and new market opportunities arise.

1.3.2 Future product-service concepts

Distribution dealers reward Alpha for their support (Alpha, 2015). As previously mentioned, providing support to distribution dealers will increase for the upcoming years. Alpha believes that introducing several product-services could meet the targets, in particular control systems, product-training, front-sale sales toolkit for measuring climate conditions or installing test products, simulation, cash flow management for dealers, offering credit insurance contracts for dealers, credit provision for low-size companies, sharing of employees in projects, big data analysis from control systems for offering sales consultancy per individual customer problem, temporary warehousing, and giving support in setting up a customized professional installation company (Alpha, 2015).

Intelligent control systems make controlling product W and climate an automatically process so that performance guarantees could be given. Beyond that, they could further assist in conforming sustainable energy regulations by optimal using the benefits of nature. An intelligent control system is also a linking pin in integrating a broader range of individual offered products. Product-training and simulations are tools for controlling project risk in the front-sale stadium. Further on, knowledge about cash management and professional maintenance could assist dealers in the after-sales maintenance.

1.3.3 Problems in the supply chain

Although Alpha is aware of the need and value of product-services, they do have no clue in what order they should be introduced, how they can be priced and should be sold. Company interviews have shown that the main barrier lies with distribution dealers withholding intelligent control systems or other product-services for very different reasons. A historical lack of focus on managing the downstream supply chain has led to a widespread dispersity among dealers in business size, product and service

portfolio, and processes for specifying and engineering projects. This makes that intelligent control systems could be prone to incompatibility, since universality between offerings is missing. Alpha foresees that success of moving to product-services depends on the willingness of distribution dealers to move as well. Currently, Alpha has no approach on how to achieve this. In addition, if dealers become enthusiast, Alpha has no clue on what concept is successful in making any service transition. Finally, dealers should have another type support when providing purely services instead of providing purely products. This means that the mode of relationship will evolve over time when dealers servitize. The following problem statement summarizes what is mentioned in above paragraphs:

“Alpha lacks insight in what and how to deliver and improve efficiently and effectively customer performance by making a transition toward product-services within and across a group of companies in the supply chain.”

1.4 Assignment

The main objective of this research study is to develop a guideline by means of a conceptual framework, including determinants, that business practitioners can use to let a group of companies in the supply chain make the transition from a product-oriented company to a service-oriented company. This concept will in particularly be applicable to the situation and variables of Alpha and its dealers. Research at Alpha will give insight what the current position of Alpha and its dealers is on the continuum, what their end-point is, and what factors stimulate or inhibit companies to make this transition from the perspective of the supply chain. The latest strategic insights in moving to product-services will be combined with supply chain management to develop a new conceptual framework for transitioning to product-services from an interorganizational viewpoint. This framework will be used to give recommendations to Alpha for achieving their servitization goals.

1.5 Research questions

By following the theoretical and business context, the problem statement and the assignment outline can the following research questions be designed to solve the main problem:

- ◆ RQ 1: What theoretical models or combination of models are present for traditional manufacturing organizations to make the shift to a more service-oriented organization?
- ◆ RQ 2: What theoretical models or combination of models are present for traditional manufacturing supply chains to make the shift to a more service-oriented supply chain?
- ◆ RQ 3: What is the current position of Alpha and its dealers on the product-service continuum and on the supply chain?
- ◆ RQ 4: What is the desired position of Alpha and its dealers on the product-service continuum and the supply chain?
- ◆ RQ 5: How should interdependent companies (Alpha and its dealers) make the transition on the product-service continuum from an interorganizational servitization viewpoint?

1.6 Research design

To answer the research questions, a methodology is used that incorporates scientific available knowledge, and knowledge retrieved from practice by empirical evidence. The model of Van Burg, Romme, Gilsing, & Reymen (2008) represents the approach that will be used in this paper, as illustrated in appendix C. Within this model, the focus can lay more at generating a model that explains the truth for science, or at developing knowledge that will be applicable in practice (Romme and Endenburg, 2006; Denyer, Tranfield & Van Aken, 2008). Because this master thesis is directed to solving particularly the challenges at Alpha, a more science-based design focus will be applied. Thus, the master thesis will start with a scientific framework from the beginning that will be redesigned and adapted towards the case by applying empirical evidence.

To answer the research questions, a two-fold methodology is chosen. Firstly, a systematic literature review will be conducted that contains the two main topics: in-depth knowledge will be retrieved about conceptual models that guide organizations successfully along the servitization continuum and it will be identified how supply chain management is performed for product-service organizations or while being in a servitization transition. From this point on, a new framework will be designed that extends the traditional servitization continuum referred to Oliva and Kallenberg (2003). This is done by making a link between interdependent companies that are benevolent in making a move on the continuum. This framework and its support by the literature review will partially answer research question one and two. The second part of the research is persistent on obtaining empirical data from current business practice around Alpha and its dealers to adapt and fill up the gaps in the initial theoretical framework. This enables practical relevance and validates the theoretical framework as a representation from reality. The master study itself can be characterized as an exploratory/explanatory multiple embedded case study, consisting of semi-structured interviews, archival company information, and observations. Hereby, propositions can be identified for further investigation and distinctive information can be revealed by broad investigation (Yin, 2013; Scholz & Tietje, 2002). The first main unit of analysis is Alpha with the subunit Alpha. The second main unit of analysis is the distribution network, and the subunits are the distribution dealers of Alpha. Semi-structured interviews are held together with seeking for archival company information and observation. With triangulation are the different sources combined (Cooper & Schindler, 2003). A within-case analysis as part of the case study will be used to position each subunit on the new theoretical framework and a cross-case analysis will be used to identify the differences and similarities between subunits by comparison (Beverland and Lindgreen, 2010). After adjustment of the theoretical framework with empirical evidence, one of the respondents of each distribution dealer is asked for giving feedback in a meeting to validate the adjusted framework. The concept will have theoretical and practical relevance if it could answer question three, four, and five of the research questions.

1.7 Thesis outline

The exploratory nature of this research and its aim to create a link between two large fields of research automatically lead to careful consideration about delimiting the research activities. There is less known about interorganizational servitization, which means that there is no real point of departure. Beyond that, there is much known about individual fields, which puts a criterion on making a concise synthesis of literature. Even so, the large number of cases is beneficial, but puts a pressure on time and coming to a unified concept. The activities are ranked in report chapters following the process down below.

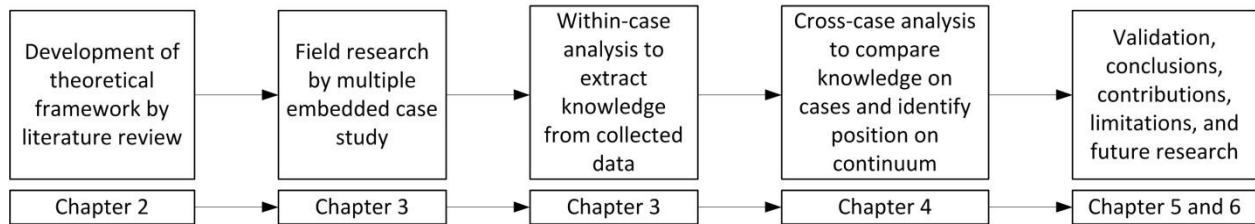


Figure 1 Thesis outline

2. Literature review

This chapter will summarize the latest relevant knowledge on how to execute a servitization process and supply chain management for services or product-services. This literature review is one of the two main sources of information that will be used to propose a strategic concept for executing a transition from selling purely products to selling product-services in a supply chain context. The other information source is empirical evidence generated by field study research, further explained in chapter three. The following paragraphs will explain one after another the methodology, deliverable, and results of the review.

2.1. Methodology

A literature review follows five stages: problem formation, data collection, data evaluation, analysis and interpretation and public presentation, further illustrated in appendix D (Randolph, 2009; Denyer, Tranfield & Van Aken, 2008). Due to time constraints and the abundance of information to match two different research fields, an exhaustive review that searches for all articles on the topics published or unpublished is beyond limits. With purposive sampling, the most far-reaching articles will be searched and selected (Randolph, 2009). The review results will be written down in a theoretical framework to highlight the latest available knowledge on the topic. The review starts with searching for all scholarly information about what is known on servitization transition trajectories, but with a main emphasis on supply chain management related to service engineering. Knowledge about servitization trajectories and capabilities will be necessary to identify interorganizational needs, which is further argued in following paragraphs. Two search methods are used. The internet databases of Google Scholar, ABI/Inform, Web of Science, JSTOR, and Scopus are used by entering search keywords or combinations of keywords linked to the topic. These databases are mainly used by scholars in industrial engineering (Reymen, 2013). The keywords are mainly found by starting to read in glance popular articles on servitization and the product-service supply chain by using articles with high citations or meta-analysis studies. Sometimes, the Boolean operator AND was used to search more specifically. While searching were the following keywords mainly used:

Servitization, product-service, PSS, service AND transition, value chain management AND servitization, intraorganizational AND servitization, supply chain management AND servitization, servitization continuum, product-service continuum, intraorganizational AND servitization, interorganizational AND servitization

The second search method involves snowball sampling (Van Aken, Berends & Van de Bij, 2012). This method uses the references of authors in an article to find new relevant articles. In particular, the articles that summarize historical findings on the research paradigm, also called meta-analysis, were quite helpful for effective snowballing. Even though these two methods result in much information, particular information for sub topics is hard to find this way. Therefore, information for sub topics is found by looking for specific key words in the abstract, introduction, and conclusion of articles or to search with synonyms for sub topics in the databases. Appendix E shows the complete list of keywords or synonyms used for particular sub topics. The articles to be used in the review are selected by several reliability or quality criteria. Only articles published from 2000 and earlier are used, except important

articles with many references in later published articles and articles should have 10 citations at least. These criteria are commonly used in management studies according to Reymen (2013). Besides that, the research on servitization has received more attention since 2005, with still some leading articles being frequently used of the period between 2000 and 2005. Articles were read at first glance to make the last selection. In the data evaluation step, information was extracted by using inclusion and exclusion criteria. The articles on servitization were set apart from supply chain management. Within the articles, sentences or paragraphs are underlined that describe either the servitization process in stages or the instruments needed to execute a stage or the supply chain aspects within a stage. The underlined sentences of each subtopic were accordingly integrated or synthesized to create a coherent and clear written literature review.

2.2.Deliverable

The central purpose of the review is to synthesize the latest knowledge on the paradigms of servitization and service supply chain management. Here after, the knowledge of both fields will be consolidated as much as possible in order to develop an initial theoretical framework of how to execute an inter organizational servitization transition. The end deliverable will answer research question one and two. The continuum will be divided in stages encompassed with the characteristics of service offerings and the capabilities for producing these product-services. Moreover, the supply chain interface is also divided over each stage of the continuum and will explain the options for configuring the supply chain, and how the relationship between two or more companies should be managed.

2.3. Results and theoretical framework

Due to space restrictions, it was not possible to give a summary of the literature review within the master thesis. The results of the literature review can be read in an apart document of Vloet (2015). Vloet (2015) elaborated on the concepts of intra- and interorganizational servitization. It explained in detail the continuum with moving from a product-oriented to a customer-oriented basis, from transaction to relationship, and differentiating between standard and customized product-service offerings. Moreover, it was clarified what kind of services were delivered for each stage and the capabilities for producing these offerings. Furthermore, the chapter on interorganizational servitization or supply chain management elaborated onto the type supply chain configurations and the four types relationship channels for communicating product-services between manufacturer and distributor. From the results of the literature review of Vloet (2015), a theoretical framework is constructed that links two or more companies when moving from selling pure products to selling pure services. The following sections will explain how this framework is constructed.

The starting point of developing the horizontal part of the theoretical framework will be the servitization continuum of Oliva and Kallenberg (2003). It was concluded from chapter one of the literature review that the linear transition as used in this model is best suited. Besides that, the central intention of the continuum is to move from a position where products are dominant in the offering to a position where services are dominant in the offering. Oliva and Kallenberg (2003) divided the continuum in four stages, with a movement from transaction-based services to relationship-based services and a movement from product-oriented services to end-user process-oriented services. However, it is better to speak about customer-oriented services than process-oriented services. The aim is not to focus on the process, but on the end-result for the customer, as was explained in chapter one of the literature review. The literature review also revealed that a distinction can be made between standard and customized services. Consequently, three type orientations will be fulfilled when a servitization transition is executed. The first orientation is the value orientation by the means-end chain, dividing product- versus customer-orientation. The second orientation is the time orientation, dividing transactionship- and relationship-based selling. The third orientation is the setup orientation of the offering, dividing between standard and customized offerings. In the hierarchical order of transition importance, the type orientation means-end chain is leading. Subsequently, the time orientation and the setup orientation follow. This hierarchy is non-disputable, as was explained in chapter one of the literature review. By using the three type orientations, each stage is delimited, is confusion about inconsistent terms in literature eliminated, and is the servitization framework more detailed by expanding to eight stages. Beyond that, customer needs will be fulfilled in the highest level of the means-end chain, in customized form, and at any time, which can be mentioned as the highest level of customer satisfaction that can theoretically be achieved. As a result of these effects, the newly developed servitization continuum can be characterized as uniform and all-encompassing. This makes that the servitization continuum can only be designed in this way.

The vertical side of the framework starts with the characteristics of product-services by using the strategic marketing planning cycle which can be found in appendix G. The cycle is a proven method for fulfilling marketing objectives of an offering (Fahy & Jobber, 2012). It is therefore used as guideline for marking the essential characteristics of services. The cycle consists of four elements: segmentation of the market, select a target segment, differentiate among competitors within this segment, and position the offering in the market by using a marketing mix (Fahy & Jobber, 2012). Therefore, the characteristics of type customer segment and the 4Ps marketing mix model are used of price, service (product), marketing & promotion (place and promotion). In contrast to the 4Ps for products, Booms and Bitner (1981) in Gummesson (2007) describe the 7Ps model. However people, process and physical evidence are incorporated on the sub chapter of company capabilities, which is the second part of the vertical side of the framework. Services are differentiated between front- and after-sale services, because they take place before and after the purchase (Posselt & Gerstner, 2005). The value of services and quality control are added as additional characteristics to get insight in the profitability of services for customer or distributor and to prevent inclusion of redundant services following the service paradox principle (Gebauer, Fleisch & Friedli, 2005).

The second part of the vertical side describes the company capabilities based upon the secondary company capabilities of the value chain of Porter (Weele, 2009: Porter, 1985), further illustrated in appendix G. Sub chapter 2.2 of the literature review already explained that this model is used, because it is a leading model in prominent books to describe company capabilities.

The third part describes the supply chain interface for managing the dyad between distributor and manufacturer of product-services, differentiating between the supply chain configuration options and the supply chain relationship channels. Chapter three of the literature review explained that this breakdown is essential in supply chain management, because a relationship will mature differently when another collaboration or relationship configuration is chosen.

The use of proven or logical explainable models as afore mentioned means that the vertical side of the theoretical framework can only be designed in this way. Figure one down below illustrates a simple flow chart of product-services within a supply chain context. This model is an adaptation of the service production process specified by Grönroos and Ojasalo (2004) in appendix H for a supply chain context. Every time a company makes the servitization transition, the production process is different as well as the input and output elements. The theoretical framework in figure three down below represents the variables for each stage on the servitization transition. A detailed version with determinants within each stage, as extracted from each paragraph in the literature review, can be found in appendix I. It should be noted that the parts about the output product-services and company capabilities are used by the distributor, but also by the manufacturer within the product-service supply chain. This framework is an adaptation of the continuum of Oliva and Kallenberg (2003), as illustrated in appendix F.

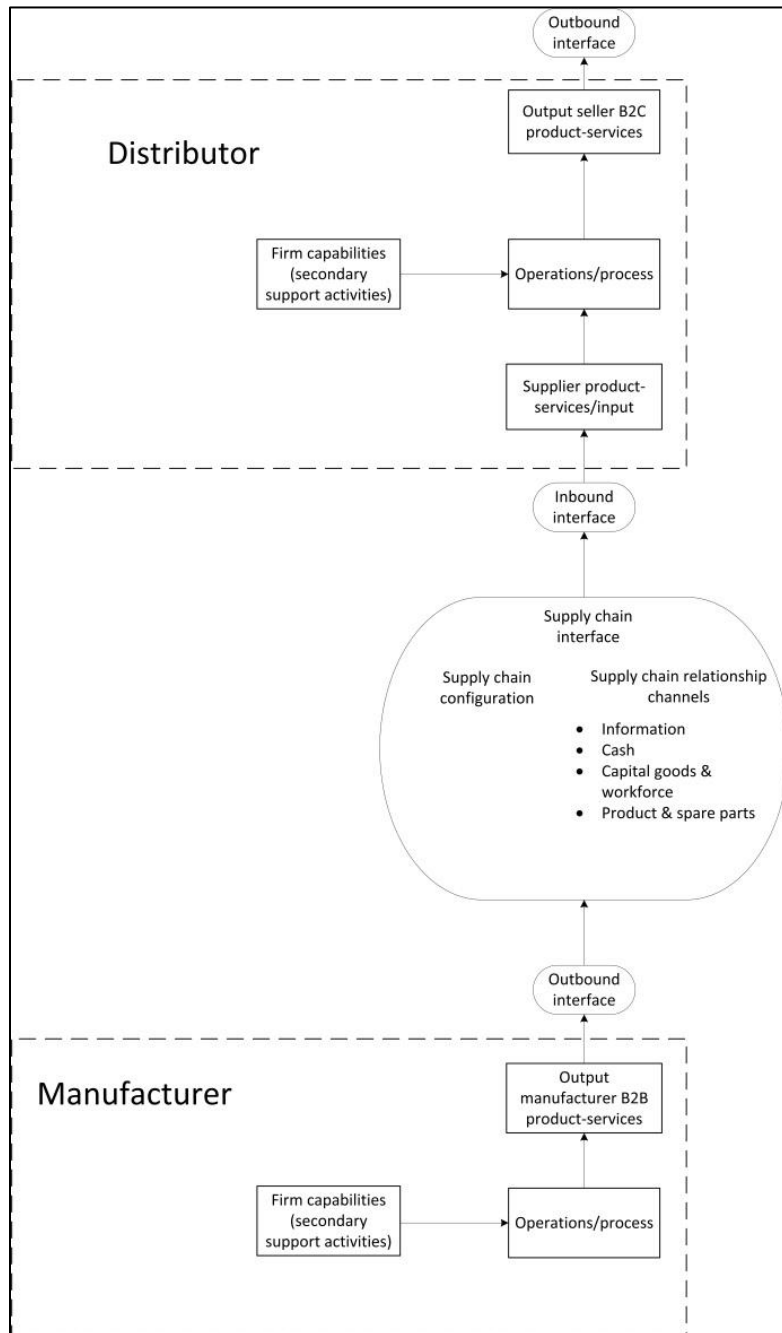


Figure 2 Product-service supply chain flow chart

Product-service continuum downstream distributor		Product dominant & service add-on				Service dominant & product add-on			
		Product-orientation (use-orientation)				Customer-orientation (result-orientation)			
Type orientation means-end chain		Transactionship-based		Relationship-based		Transactionship-based		Relationship-based	
Type orientation time		Standard		Customized		Standard		Customized	
Type orientation setup		Standard		Customized		Standard		Customized	
Output product-services									
Front-sale services									
After-sale services									
Value of services by customers									
Value of services by the company									
Type customer segmentation									
Service marketing & distribution									
Service pricing									
Service quality control									
Firm capabilities (secondary support activities)									
Firm Infrastructure	Information								
	Finance								
	Control & planning								
	Organizational (infra)structure & process								
Human resource management									
Service development									
Service procurement									
Supply chain interface									
Supply chain configuration					Becoming system integrator				
					Upstream integration of exclusive capabilities				
					Strategic partnership between manufacturer and seller				
Supply chain relationship channels	Information								
	Cash								
	Capital goods								
	Product & spare parts								

Figure 3 Theoretical framework without determinants

2.4.Conclusion

The purpose of this literature review was to synthesize the latest knowledge on the paradigms of servitization and service supply chain management and to consolidate this knowledge in a theoretical framework. It can be concluded that the review on intraorganizational servitization outlined in detail the available theory on making a servitization shift in stages and what capabilities are needed to execute this shift. Even so, the review on interorganizational servitization outlined in detail how the supply chain should be configured and managed when moving to a product-service organization.

The consolidation of all available knowledge into the theoretical framework has led to a clear unambiguous concept for how to make a servitization transition, and what elements play a role in accomplishing each stage of the transition. As such, research question one and two are answered. The developed framework will be further validated and broadened with empirical research, which will be the main content of next chapters.

3. Within-case analysis

3.1 Introduction

This chapter consolidates and summarizes the information retrieved by semi-structured interviews, company information, and observation from each case company. The generated findings will be used for filling in the gaps of the theoretical framework if possible or validate findings from literature with the cross-case analysis in the next chapter.

3.2 Type research study

The second part of the research is persistent on obtaining empirical data from current business practice around Alpha and its dealers to adapt the initial theoretical framework. This enables practical relevance and validates the theoretical framework as a representation from reality. The master study itself can be characterized as exploratory as well as explanatory. According to Yin (2013) is an exploratory study about investigating 'what' questions; questions with the aim to look for propositions that can be further investigated. In this study, the aim is to identify determinants that make interorganizational servitization transition successful. An explanatory study is about finding out the causal-effect relationships underlying a phenomenon (Cooper & Schindler, 2003). Yin (2013) argues that a case study is an ideal research method for exploratory studies where a new topic will be scrutinized. Its ability to collect data with multiple instruments leads to a broad investigation (Scholz & Tietje, 2002). Beyond that, it is a method suitable for explanatory research by looking for the similarities and differences among cases by within- and cross-case analysis. More quantitative methods like conjoint analysis do not fit here, because each dealer of Alpha will have its mutually exclusive business model in approaching customers (Hair, Black, Babin & Anderson, 2010). A case study could reveal distinctive information.

3.3 Unit of analysis

The qualitative data will be collected by a multiple embedded case study (Yin, 2013). The first main unit of analysis is Alpha with the subunit Alpha. The second main unit of analysis is the distribution network, and the subunits are the distribution dealers of Alpha. A multiple embedded approach could better validate empirical research and as a result lead to higher generalizability. Upstream dealers are not included in the case study, because of the short time span of the master thesis and company interviews have revealed that they operate in a more product-focused transactional relationship. A complete overview of the supply chain is illustrated in appendix A. End-customers are not included as well, because of the short time span of the master thesis and the focus lies on servitization between producers of product-services in the supply chain, not the effects on the customer. Dealers will be selected based on having a full-spectrum of expertise and by their heterogeneity profile (distinctive demographic and business or usage variables (Wouters, 2014). This will make the generalizability impact of the research stronger, because Alpha dealers differ from each other in these aspects (Patton, 2002; Flyvbjerg, 2006).

3.4 Case selection

Cases are selected by theoretical sampling instead of statistical or purposive reasons (Blumberg, Donland & Pamelas, 2005). With theoretical sampling, cases are selected based on categories. To create

the most heterogeneous sample, the following criteria will be applied and scored: type partnership, company size in level of order intake at Alpha, share of wallet via Alpha, in-house production, country, presence of multiple partners per country, main customer sector, type DMU and average service level. These criteria are chosen, because Alpha segments their dealers based on these criteria. It was assumed that all dealers sell in general all type Alpha products (Alpha, 2015). The distinctiveness ensures that a recurring pattern will emerge for fulfilling theoretical saturation and in turn making the framework more valid (Strauss and Corbin, 1990). Case selection is done from a list of potential distribution dealers, of which some are excluded anyway. Dealers that did not have any transaction last year are not of interest, because there is no future trading potential. Dealers like company X and Y are competing with Alpha products (Alpha, 2015). It is therefore not worthwhile to collaborate in servitization practices (Alpha, 2015). Very small size companies are much excluded as well, because they have a small market to exploit (Alpha, 2015). However, a few are included, because they could offer insight in why their share of wallet of Alpha is small (share of wallet means partition of products that are bought at Alpha in relation to Alpha's direct competitors) (Alpha, 2015). In total, 13 companies were selected. More cases are selected initially, because the long list of distinguishable criteria and eventually less interest to participate in the study could lead to too less respondents. From the 13 companies, five companies were excluded from the research afterwards, which is further elaborated in paragraph 3.7. Appendix J shows the complete list of dealers. It was decided to investigate all 8 companies, because heterogeneity criteria should be fulfilled and empirical evidence should be validated by theoretical saturation.

3.5 Respondent selection

A quick round of contact with potential dealers shows that two or three interviews should be held within each company to get a comprehensive image. They are in charge of purchasing and sourcing at Alpha or selling products to customers. This sounds obvious, because many installation companies are SME's and hence having multi-skilled people employed (Alpha, 2015). Again, theoretical saturation will be reached since the marginal new information from other employees will be very low. At Alpha, interviews are held with the management team (CCO, CFO, CIO), with the export account managers (4 people), and managers sales support (6 people) responsible for the interviewed dealers. The reasoning here is that the management team is responsible for the configuration of the supply chain and contracts with dealers, whereas the export account managers and managers sales support are responsible for managing relationships by receiving feedback and sending service support. This leads to a comprehensive overview of the relationships.

3.6 Data collection

A semi-structured interview method is chosen, because it is assumed that each dealer has its individual complaints, ideas, and comments on products and services. This means that by probing extra in-depth tailored questions should be asked at dealers to get a full perspective on their opinion (Blumberg, Donland & Pamelas, 2005). The respondents will be interviewed face-to-face via a conference call or at the company if a visit was planned in advance by the dealer. The semi-structured interview will be a little different from the unit of analysis to focus on particular aspects. The individual variables of the theoretical framework were used as input for research questions. The research questions were formulated as a representation of the point of interest what should be known afterwards. For the

variable customer segmentation, a distinction is made based upon how the market and Alpha segment customers or stakeholders. For the supply chain configuration, respondents are asked about their positive versus negative opinion about the current relationship in order to describe the advantages versus disadvantages over each type configuration. Sometimes, extra probing questions are asked for relationship channels. These questions are based upon the underlying core elements of this channel. The same research questions are asked for the future situation, but written down in the future tense. Appendix K shows the interview guideline. A pre-test is held for right interpretation of the research questions. In order to analyze the data after interviewing, they are recorded on audio after permission of the respondent. If permission was not granted, answers would be written down by an assistant at Alpha. In addition, archival documentation is obtained like SLA-contracts, working protocols, KPIs and service engineering worksheets. Appendix L was used as format for seeking archival documentation. This format was designed by listening carefully during the interviews about what information related to documents and by observations within the general information system. During the internship at Alpha, observations within the department are extremely helpful in getting a good overall image and interesting topics were probed while interviewing. With triangulation, the different sources are combined (Eisenhardt & Graebner, 2007; Cooper & Schindler, 2003). Eisenhardt (1989) mentions that multiple sources of data from case studies lead to construct validity and reliability.

3.7 Data analysis

The semi-structured interviews are transcribed. A within-case analysis as part of the case study will be used to identify unique determinants for each variable questioned on each case. The unique determinants together with other data will be positioned on the corresponding position on the theoretical framework. The determinants form the empirical evidence to test whether the initial theoretical framework, based on previous research (literature review), holds in the new situation with these units of analysis and to expand the framework with new practical evidence and preliminary theory generation from evidence (Eisenhardt, 1989). The uniqueness and explorative nature of this assignment makes it little worthless to use a form of computer coding, because this form of analysis looks at commonalities (Hair, Black, Babin & Anderson, 2010). As mentioned earlier, five potential cases were excluded from data analysis. There was lack of enough participation in interviews, interest to take an interview at all, or less available archival data, which were reasons to exclude them. Remarkably, these five cases are all VAR type partners with a >100% share of wallet. It could be a sign that VARs are less interested to build a strong mutual relationship. This is further explained in the following chapters. Because nine case companies were selected and questions on both intra- and interorganizational ser vitization were asked, the total data collection of transcribed interviews and archival data was large (>330 pages). A within-case analysis was drawn from this dataset by selecting and combining relevant sentences, what resulted in a detailed analysis of approximately 80 pages. Due to space restrictions of the report and the many variables of investigation, it was unfortunately not possible to give a decent summary of the analysis for each case. Even more, a within-case analysis does normally include a comparison of cases with existing literature (Yin, 2013). Comparison with literature is included in the cross-case analysis of the next chapter to shorten space as well. The detailed within-case analyses results can be found in an apart set of appendices. However, the reader will still get a clear image of the

situation of each case by the general case descriptions in the next paragraph. Besides that, a summary of the within-case analysis can be found in appendix N.

3.8 Results by detailed case descriptions

3.8.1 General case description Alpha

Alpha has been founded X years ago together with the sales division Beta, that later became an individual company as well. Both of them are part of Alpha, owned by investors. Alpha is a world-class manufacturer and supplier on product W, energy conservation, and product Y solutions, represented by product Z and ventilation products. The business focus is aimed at delivering high-end products suited to each customer purpose. With its mission slogan, Alpha is dedicated to deliver the best nature has to offer by its integrated solutions, in order to create climates. Its vision is to use product W in the most efficient way. The annual turnover of Alpha is €X mln and Alpha employs over X people divided by two locations; one in place X, the Netherlands, and one in country X. Alpha products are sold via dealer companies to all kinds of building types. Three of them are owned by Alpha; Beta, Gamma, and Epsilon. The other dealers are divided by exclusive Alpha dealers (VAPs) and value added resellers (VARs). Differences between dealership and effects on services are explained later on. With this network, market coverage is reached for a great extent in Europe. Competitors of Alpha are companies X and Y. Alpha manufactures their products in-house and product Z that are bought from suppliers, even as control panels and other small equipment. In future, Alpha would like to develop and produce mostly extensions or product options and intelligent control systems as part of their focus on professionalizing service offerings provided to customers. Alpha delivers moderate service in the front-sales and low services in the after-sales to customers (dealers). Interviews are held with the account managers, sales support managers, business developer, and commercial director, because they are allied to providing customer service.

3.8.2 General case description Beta

Beta has been founded together with Alpha around X years ago, at that time one company. Today, Beta is part of Alpha, included Alpha as well. Alpha is owned by a consortium of investors. Beta sells and maintains product W, ventilation, and product Y products as stand-alone products, but preferably as an integrated system. Within this portfolio, Beta is specialized in medium-large product Z. The size of Beta is about €X mln, with X employed people, operating from place X, the Netherlands. Beta operates in all customer segments, with a focus on the utility industry about 90%. Within the market, Beta is exclusive dealer of Alpha products (order intake €X mln) and auxiliary products are bought elsewhere. Beta faces competition, but has substantial market share in the Netherlands. Product Z was also sold within Europe, but that strategy has ended a few years ago. In terms of the level of service, Beta delivers extensive front-sales and after-sales, whereas both sides get recently more attention to professionalize further. Maintenance is actually now an apart division. For the interviews, the managing director, the manager operations, the financial manager, service coordinator, and manager product installation are interviewed.

3.8.3 General case description Gamma

Gamma has been founded one year after Beta in year X and was taken over by Alpha in year X, therefore now called Gamma, an intercompany sales partner in Alpha. Gamma sells ventilation and product Y, as stand-alone products, very rarely as integrated controlled systems. Product Z projects were divested a couple of years ago, after first acquiring a product Z seller. The size of Gamma is about €X mln, with X employees employed, operating from Belgium. Gamma operates in all customer segments from factories to all types of commercial buildings with a focus on industry for 70% and a large focus on factory buildings X. Gamma is exclusive dealer of Alpha products (order intake €X mln), with buying only a few non-related products elsewhere. Within the Belgium market, Gamma is market leader with an almost saturated market share. In future, Gamma is focused on running their own businesses well and from there acquire a company in product Z and expand further. Gamma delivers mainly front-sales service and they recently started with after-sales S&M by learning from the experiences at Beta. Within Gamma, the managing & sales director and the operations & service and maintenance manager are interviewed.

3.8.4 General case description Delta

Delta has been founded in year X by the current managing director and was also taken over by a consortium of investors as owner of Alpha in year X, now called Delta and also an intercompany. Delta is only active and specialized in service and maintenance of product Y and ventilation products. Due to strugglings in the market at the start of the worldwide economic crisis and facing heavily competition, Delta has decided to stop with selling products by projects. Delta is specialized in giving professional and very responsive service and maintenance, not only for Alpha products, but also those of competitors or other types of maintenance. Delta makes around €X mln revenues, with X people employed, operating from Great-Britain. Delta services and maintains in all sort of customer segments with a focus on commercial buildings for 80%, whereas in the past with projects it was around 50%. Delta is exclusive dealer of Alpha products and spare parts (order intake €X). Other spare parts are bought from competitors or third-party sellers. As said, Delta faces heavily competition in the market and conflicts with other Alpha dealers. In service and maintenance, Delta has a strong position, but competitor X is expected to have the lion's share, others are much neglecting after-sales service. Front-sales are not very relevant, because Delta negotiates with large facility management contractors. In future, Delta would like to incorporate other products to service. Semi-structured interviews are held with the managing director and the operations director.

3.8.5 General case description Epsilon

Epsilon has been founded in year X by the current director as an independent company and is Alpha dealer since year X as well. Epsilon is specialized in ventilation and product Y, although they also deliver Alpha product W products, and are specialized in complex buildings. With some control technology, basic product integrated systems can be delivered. Epsilon makes around €X mln in revenues with X people employed, operating from Great-Britain. Epsilon is active in industry and commercial building segments for each 50%. Epsilon is exclusive dealer from Alpha products (order intake €X mln). They deliver other products with other suppliers. Currently, Epsilon is facing more competition of other Alpha partners, but their company is well-established in the U.K. market and has some activities in the Middle-

East. Currently, Epsilon is heavily growing due to economic growth, with the intention to grow further in ventilation, not in product Z. Epsilon offers moderate front-sales services and is less active in after-sales servicing. Semi-structured interviews are held with the managing director and the project manager.

3.8.6 General case description Zeta

The company Zeta has been founded by Mr. X and Mr. X as former employees of company X in year X. Both of them are still owner of the company and have always been an ally of Alpha. Zeta offers the complete assortment of Alpha products. Zeta annually makes around €X mln in revenues, with X employees, located at Germany. Zeta only works in the industry sector or factory buildings as customer segments for the installed base customers. Due to the small size of the company, complex and risky projects will be left over to competitors. Due to the regional operating area, Zeta faces little competition, because they are not seen as competitors; they operate in a nice market area. The very large majority of products are supplied by Alpha by exclusive dealership (order intake €X mln). In future, Zeta has no growth plans in any direction and it is questionable whether the company can be taken over. Zeta delivers moderate services in the front- and after-sales, which is remarkable for the size of the company. Mr. X is used as source for the interview, because the company is small.

3.8.7 General case description Eta

ETA was founded in year X as a ventilation service company and still independent. In the years thereafter, Eta did develop themselves as a supplier for ventilation and some standard product Z. Eta has a turnover of around €X mln, working with a team of X people, and located in Ireland. Within the market, industry or factory projects are less represented (10%), with 90% commercial buildings as customers. Within the commercial segment, Eta contracts every kind of project, with a main focus in projects around place X. Eta is an exclusive Alpha dealer (order intake €X mln). They are in relationship with Alpha since year X. Additional products are bought from company X. They also deliver other products. Very recently, they are facing heavy competition from another Alpha partner who became exclusive dealer in place X, Ireland as well. In near future, Eta's ambition is to grow further in product Z and expand in product Y and ventilation by hiring new employees. Eta is currently delivering front- and after-sales on a moderate basis with a service and maintenance department. In the company are the managing director and sales manager interviewed.

3.8.8 General case description Theta

Theta has been founded X years ago and sells product Y and ventilation products. In contrast to other dealers, Theta is only active in product Y. They also lack their own expertise, because they outsource engineering and installing equipment. The company has an annual turnover of €X mln, with X employees, operating from Malaysia. They work in all kinds of customer segments, but mainly industry, between 65-75% of the projects. Currently, product Y regulations are tightened in abroad countries, meaning that Theta penetrates Malaysia, but also Thailand, Vietnam, and Indonesia. They buy ventilation products only from Alpha (order intake €X mln) for over X years as value added reseller. Other products are bought from other suppliers. They face a very competitive market with competitor X and Y. In near future, they like to expand with other kind of products, but they are struggling with regulations, organization qualities, and market needs. Theta delivers front-and after-sales to an

expected moderate to low level, and if they do, they are most of the time outsourced. For the research, interviews were held with the technical and commercial director, and the office manager.

3.8.9 General case description Iota

Iota has been founded X years ago by the current director and offers ventilation, product Y, and other products. Iota is specialized in building synergy between innovative technology products, what leads to product Y ventilation and advanced customized product Z, with some extent of controlling technology. The annual revenue is €X mln with X employees, working from Asia. The ratio working for commercial versus industry customer segment is almost equal, with 60% commercial. Projects are executed in Asia. Iota is valued added reseller of Alpha (order intake €X mln) since the company foundation. Within Asia, Iota faces a lot of competition in the market. In near future, Iota is looking for innovative products from Alpha or products that are more competitive in terms of pricing. The services in the front- and after-sales are moderate to high, which is also reflected in the level of complexity of projects they realize. The director and product manager are interviewed for the research.

3.9 Conclusions per case

3.9.1 Alpha

Firstly, from the within-case analysis, it can be concluded that Alpha is delivering not only product-services that are further processed and delivered to the end-customer by the dealer. They also give different types of service support in setting up a dealer organization, assistance in professionalizing their core activities, and marketing. These services are called productive services. Secondly, it can be concluded as well that Alpha is thinking in one-off projects, instead of long-term collaborative bonds. This is reflected by the business culture within the building industry, where it is normal that a building is build and maintenance is something the customer does not think about yet. Therefore, Alpha is not much involved in after-sales services, although they provide sometimes product upgrades and have customized complaints handling whenever asked by the customer. Thirdly, in terms of the Alpha capabilities, it can be concluded that Alpha has a large pool of resources to put upon, which is reflected by the activities with dealers. The capabilities for making a product-service transition are therefore within short reach after some adaptations. However, exploitation of these resources is yet absent, since service development and purchasing additional services is very preliminary. Fourthly, it can be concluded that the current supply chain structure hampers. There is a belief in working by partnerships with dealers, but configuring and managing these partnerships is done by transactional selling of products and giving service support is allied to solving problems at the dealer site.

3.9.2 Beta

Firstly, it can be concluded that Beta is delivering high professional front- and after-sales services for stand-alone product solutions. Due to customer needs and competition within the market, Beta is forced to deliver turn-key solutions, which are directing towards delivering process-oriented consultancy as intermediary service for delivering a product. These newly acquired capabilities are accordingly marketed towards new customers. However, the product-service solutions stop after the stand-alone product solutions. Secondly, it can be concluded that Beta is facing a large discrepancy in support of product-services from Alpha. Beta is trying to develop complementary products and control systems on

their own, which does actually belong to the manufacturer. Even more, Alpha hires sometimes expertise from Beta for giving support to other dealers. Thirdly, it can be concluded as well that an intercompany structure has both positive and negative implications on relationship management. The many advantages of having directly and controllable access by Alpha on Beta, leads to abandonment of giving priorities on managing the relationship in relation to other dealers, from the Alpha side.

3.9.3 Gamma

Firstly, the results have shown that Gamma is operating in an almost saturated market, while simultaneously having a market leading position. Similar to Alpha, the building market was until very recently seen as one-off projects. However, it can be concluded that due to market saturation, Gamma is forced to penetrate the after-sales market, in particular for building refurbishment in order to generate future sales. Secondly, Gamma is not yet operating much within product Z. In past years, they have acquired a few other companies in order to build up expertise, but this has not resulted in better capabilities for Gamma. Hence, it can be concluded that Gamma does not have enough management support and support in leveraging capabilities from Alpha to Gamma. Thirdly, it can be concluded that although after-sales services are becoming advanced, the marketing, segmenting, and positioning of services is in general still undeveloped for services. The company seems not to be aware of the differences in tactical marketing mix for products versus services. Analogously, it was mentioned in interviews that company capabilities have shortcomings that were not foreseen and should be improved. This conclusion seems to hold for all capabilities of investigation.

3.9.4 Delta

Firstly, it can be concluded that Delta is an extraordinary example of a company that is solely delivering after-sales services in a product-oriented selling market. Hence, they are professional to the very extent, focusing on many details. This is due to the fact that their business proposition is reliant upon facility management contractors that lead the after-sales building market. The negotiation position of FMs has led Delta to come up with high quality service offerings. Secondly, it can be concluded that Delta is becoming a victim of the export strategy of Alpha. Heavy competition between Delta and non-intercompany dealers has led Alpha to decide that Delta should only sell after-sales services anymore. Since selling products is strongly related to providing front-sales services, this is the reason that Delta is not involved in front-sales service activities. Thirdly, it can be concluded that much value is discarded, because front- and after-sales services are mutually influencing each other. The within-case analysis has shown that end-customers are closing deals with FMs, whereas with project involvement Delta would have had a much larger stake in delivering directly after-sales services. On the opposite site of the spectrum, after-sales services can lead to generation of new project activities, what should now be outsourced. Fourthly, it can be concluded that similar to Gamma, Delta does not seem to be aware of the fact that services should be marketed differently from products and have company capabilities even more shortcomings, partially due to the fact that front-sales services are not delivered.

3.9.5 Epsilon

Firstly, it can be concluded that Epsilon is having a blind spot in keeping an eye open in the after-sales market. They are missing huge opportunities for earning revenues in the after-sales, as being told that

customers have alternatives for which they look for in case they have after-sales needs. It is expected that the after-sales service needs of customers are even higher than Epsilon knows, since customers are only in preliminary contact with Epsilon in the after-sales stadium. Secondly, it can be concluded that transition activities from moving to a service-oriented supply chain can result in relationship damage. The results from the analysis have shown that a strong and well-respected trustworthy relationship with Alpha is more vulnerable to damage, since every minor change within Alpha will affect the partner. This happened in the way Alpha has reconfigured the principle of separating dealers within one country, without discussing this option with Epsilon. Thirdly, Epsilon is acknowledging that professional services can be delivered structurally if company capabilities are constantly aligned. With external support from Alpha and others, they are able to deliver high professional services, but as more customers are asking these services, this volume can only be delivered with in-house expertise.

3.9.6 Zeta

Firstly, it can be concluded that overall, Zeta is very unprofessional in delivering and producing product-services. Although their customers ask some standard form of after-sales services, many worries or needs fulfillment are left over to competitors. The company capabilities are even outdated for being a product-oriented company. Secondly, it can be concluded that working in a product-service partnership, even in its most basic format, can exist, because Zeta is very satisfied about collaborating with Alpha. Thirdly, it can be concluded that companies like Zeta, not being much involved in taking upon market opportunities, seem not to balance their company activities. The analysis has shown that Zeta has a wide range in the level of professionalism in service characteristics and company capabilities.

3.9.7 Eta

Firstly, in conclusion it can be said that growing from a service and maintenance company towards a normal product-oriented company is possible, because this is what happened at Eta. So Eta has started as a company not within the first stage of the product-service transition. This process was achieved by leveraging expertise in the service and maintenance to installation of complete products, instead of only spare parts. Secondly, similar to Epsilon, Eta is becoming a victim of the way Alpha has transformed the partnership configuration in dealing with multiple dealers within one country. The analysis has shown that Alpha has not taken into account the option of competition in bidding for the same project by dealers in one country. Eta has faced damage in trusting the Alpha strategy and eventual negative outcomes it would have for Eta. Thirdly, it can be concluded that the current reactive collaboration between Alpha and Eta has resulted in generating less mutual benefits. Eta is purchasing some newly services at external parties, even as complementary products for ventilation. So, mutual benefits will not be generated by dealing in larger trading volumes, but in different kind of trading items. Since Alpha is not proactively opting for delivering other forms of product-services to Eta, Alpha is also not aware of purchasing activities at Eta.

3.9.8 Theta

Firstly, it can be concluded that cultural market differences per country affect the speed to which a product-service transition can be completed. In the case of Theta, people are thinking in the short-term, having no intention to make long-term budget plans in order to finance their business. They call Theta in

case they face a problem. This is reflected in the model of national cultural dimensions of Hofstede (Itim International, 2015). It is therefore difficult to generate extra revenues in case there are no customer needs or worries about lifecycle costs. Secondly, it can be concluded that country regulations and political games make it hard for Theta to deliver more extensive services. The analysis has shown that political games influence the free market operations. In addition, it is hard for Theta to hire and train people within the company, because there are less people available to hire within their own country and there are work permits. Thirdly, it can be claimed that dealers like Theta, operating from another continent, are subject to negative consequences of inefficiencies in getting product-service support from Alpha. The long distance creates additional hurdles in delivering capital goods and product or spare parts. Extra support from Alpha with an office or service hub in Asia would solve this problem, but this is only profitable when costs can be shared over more dealers.

3.9.9 Iota

Firstly, it can be concluded that the differences in business culture between Iota and Alpha affect the way a relationship should be managed between the two companies. The analyses have shown that communication can be interpreted differently, because different standards or way of communicating are used by each party. Companies should therefore not take for granted that communication will be established as similar to other companies. Secondly, similar to Theta, it is much harder to collaborate over a long distance in terms of capital goods and product or spare parts. Alpha should be aware that companies like Iota, with a professional approach to customers and lucrative market demand, could be very valuable for generating future revenues and avoiding competition in more saturated European markets. If long-distance relationships could be managed well, without many investments, this would probably counterweigh against penetrating competitive markets. Thirdly, similar to other more advanced product-service dealers, it can be concluded that Iota has yet no clue on how to servitize further, because the marketing mix of services and company capabilities is still underdeveloped, company growth in services is yet on hold and Iota has shown much interest in grasping the benefits from this research.

4. Cross-case analysis

4.1 Introduction

The cross-case analysis is meant to compare the cases within and across units of analysis in order to find out the similarities and differences. This has three purposes. Firstly, it can exclude whether the theoretical framework is in harmony with empirical evidence, since some case variable results could probably not be aligned well with the continuum, whether the case study data collecting and analysis were inappropriate, or that Alpha and/or Alpha dealers are lacking service determinants. Secondly, it can reveal underlying theoretical mechanisms or factors for development and execution of product-services in the field, which contribute to universal scientific theories of servitization and supply chain management. Thirdly, the results can be used to position each case in relation to each other and in relation to literature (Beverland and Lindgreen, 2010).

4.2 Unit of analysis

The cross-case analysis will be based solely on the data retrieved for the within-case study. A minimum requirement for successful cross-case analysis is to have two or more cases as input data for analysis, which is the case here (Beverland & Lindgreen, 2010). Similar to the within-case study, there are two units of analysis, with in total nine cases. The first unit of analysis is Alpha with the subunit Alpha and the second unit of analysis is the Alpha dealers in the distribution network of Alpha.

4.3 Data analysis

The content of the analysis is to compare cases on similarities and differences at each variable of investigation in the theoretical framework. In total, three sorts of comparisons are held:

- Alpha dealers are compared with each other to check whether they are equally positioned from each other on the continuum for each variable, what differences and similarities can be identified between dealers across individual variables and on the whole set of variables and what underlying arguments could explain this discrepancy or commonality.
- The two units of analysis (Alpha versus dealers) are compared to check what differences and similarities can be identified between each other related to the supply chain position and what underlying arguments could explain this discrepancy or commonality.
- The data analysis from the cases will be compared with existing knowledge in literature to identify differences and similarities and explain potential deviations.

The process of comparing cases is done as follow: extracted determinants from the cases and theory are analyzed on being similar, different, or not present in others. Similarity or difference is analyzed by interpreting the meaning of the determinant. If there were multiple meanings possible per determinant, the determinant was modified and another determinant added.

In the next step, it was determined what the position of determinants on the continuum should be or whether the determinants from literature should be set onto another position. The position is determined by comparing the meaning of the determinant with the purpose of each transition stage and by ranking the level of service advance of determinants among each other. In the next step, the position of each case on each variable is determined by counting the ratio of determinants each case possesses

and not possesses for each stage on the continuum. The average level is marked as the position of each case for the particular variable.

In addition, in the cross-case analysis are different meanings also further explained in order to reveal underlying cause-and-effect mechanisms and draw further conclusions from the results. These explanations are given based upon existing available scientific knowledge that could be inherent to the particular subject or by identifying any other logical explanation that could declare logically why certain field research output data were obtained. The next paragraph will show the results from the cross-case analysis.

4.4 Results

Appendix M summarizes the results of the cross-case analysis of each variable of investigation. A more detailed version can be found in an apart set of appendices. From the results, a modified theoretical framework will be drawn. The results will reveal whether the empirical evidence and literature knowledge should be added or removed from the theoretical framework. To be more specific, the theoretical framework will be adjusted with:

- Existing theoretical knowledge with a significant contradiction with the cases will be rejected from the framework (red color). Even so, knowledge that is not in contradiction and not found in cases but still sounding realistic will remain (black color).
- Empirical evidence with a significant commonality across cases and/or literature will be added to the theoretical framework. The strong indication is that this evidence will be generalizable across other companies (green color).
- Empirical evidence with a significant controversy across cases and/or literature will not be added to the theoretical framework. The strong indication is that this evidence will be a mistake of case study research or not beneficial in the long-term for the company and thus not generalizable across other companies.
- Empirical evidence that sounds realistic to use in servitization and can be argued without literature will be added to the theoretical framework. Future research can further proof the generalizability over other field cases (blue color).
- Opinions about future desired positions with a significant commonality across cases and/or literature will be added to the theoretical framework. The strong indication is that this evidence will be generalizable across other companies (pink color).
- Opinions about future desired positions that sound realistic to use in servitization and can be argued without literature will be added to the theoretical framework. This content can be used as input for future research to be validated (orange color).

4.4.1 Positioning of cases on the continuum

4.4.1.1 Introduction and methodology

The comparison of variables for each case has resulted in a position or marking point of each case on each variable. Case positions are quantified to enable accurate positioning, calculate the general deviation within cases on variables, between cases and Alpha, across cases, and among topics of interest (output product-services, capabilities, supply chain interface, upstream supplier). This is done by giving

each marking point a value of 0 for the upper-left position and 8 for the upper-right position on the continuum. Hereafter, the mean and standard deviation are calculated to represent the goodness-of-fit. The goodness-of-fit value means to what extent the case company scores the same values on all variables (Field, 2009). Perfect alignment would be with standard deviation zero. In that case, the case does have maximum vertical alignment among all variables. Maximum non-alignment would be standard deviation four. In that case, the case would be marked as service-oriented for some variables, but product-oriented for other variables. By calculating the standard deviation, instead of calculating the number of out of line variables, large discrepancies would be higher weighted in the deviation from the mean. It was also possible to calculate the mean and standard deviation for each individual variable over all cases horizontally, but this was no subject of interest. Appendix S shows the detailed results of the current and future position of cases on the continuum. The tables down below show the results from calculations. The paragraphs down below discuss the results of the positioning of cases on the continuum.

Current position of cases on continuum									
	Alpha	Beta	Gamma	Delta	Epsilon	Zeta	Eta	Theta	Iota
Case company									
Case company number	1	2	3	4	5	6	7	8	9
Mean position	2,1	3,2	2,7	2,9	1,7	1,5	1,7	1,2	1,6
Standard deviation from mean position	0,8	1,0	0,9	1,2	0,8	1,1	0,9	0,7	0,9
Mean position of dealers	2,1								
Standard deviation among dealers from mean position	0,7								
Position of topics of interest									
Mean position output product-services	2,2	3,8	3,1	3,7	1,8	2,5	2,5	1,5	2,2
Mean position company capabilities	1,7	3,3	2,7	2,8	1,7	0,8	1,1	1,2	1,6
Mean position supply chain interface	2,4	2,0	1,9	1,9	1,6	1,0	1,2	0,5	0,6
Standard deviation among topics of interest	0,3	0,8	0,5	0,7	0,1	0,8	0,7	0,4	0,6

Future desired position of cases on continuum									
	Alpha	Beta	Gamma	Delta	Epsilon	Zeta	Eta	Theta	Iota
Case company									
Case company number	1	2	3	4	5	6	7	8	9
Mean position	4,3	4,8	4,1	4,2	3,1	1,6	2,8	2,1	2,8
Standard deviation from mean position	1,0	1,1	1,3	1,4	1,1	1,1	1,3	0,7	0,8
Mean position of dealers	3,2								
Standard deviation between dealers on continuum position	1,0								
Position of topics of interest									
Mean position output product-services	4,7	5,3	5,0	4,9	3,8	2,4	3,9	2,4	3,5
Mean position company capabilities	4,1	5,3	5,0	4,9	3,8	2,4	3,9	2,4	3,5
Mean position supply chain interface	4,1	3,3	2,5	2,6	2,3	1,1	1,6	1,4	2,1
Standard deviation among topics of interest	0,3	0,9	1,2	1,1	0,7	0,6	1,0	0,5	0,7

Table 2 Calculation results of current and future position of cases on continuum

4.4.1.2 General deviation within cases on variables

The goodness-of-fit line within cases shows that variables for case companies align well with each other (standard deviation 0.7-1.2). However, the level of non-alignment increases when case companies move to future positions (standard deviation 0.7-1.4).

4.4.1.3 General deviation between dealers and Alpha

Remarkably, there is no deviation between the mean position of dealers and Alpha on the continuum (2.1 vs. 2.1). However, by looking at the results can be mentioned that intercompanies are lacking upstream service support from Alpha. Alpha is therefore operating in a reactive but most profitable mode in the short-term. The efficiency of resources used is highest, since the demands of both low and high level service companies are fulfilled. They can therefore be classified as operating on exploitation (Lavie, Stettner & Tushman, 2010). When moving towards servitization, they should give enough back-up support or incentives for high level service companies to move further. Their operation efficiencies of using resources for service operations could temporarily be decreased, because these resources or competences are only applicable to a few companies. Alpha will then be classified as operating on

exploration (Lavie, Stettner & Tushman, 2010). The future ambition of Alpha is to move two steps on the continuum, while dealers move one step. This ambition supports a change in Alpha's mindset.

4.4.1.4 General deviation across cases on variables

The mean position on the continuum for the supply chain is 2.1, meaning that most companies just entered product-oriented relationship-based selling. The variation among cases is a little more than half a stage (0.7), which is not quite large. However, the intercompany cases are much forwards other cases with already entering customized relationship-based selling. The future mean position on the continuum is 3.2, meaning that dealers are willing to move in the servitization continuum unconsciously. The variation among cases tends to increase as well (1.0), since some dealers are more ambitious than others.

4.4.1.5 General deviation among topics of interest

For each case company were three topics of interest treated: output product-services, company capabilities, and supply chain interface. By calculating the standard deviation among the topics of interest, it could be revealed whether service offerings were produced with lack or abundance of company capabilities or with a lack or abundance of interaction with the upstream product-service supplier.

The results show that the variation among cases about topics of interest is much higher than variation among cases about all variables of interest. Alpha and Epsilon have a quite good goodness line of fit among topics, Gamma, Theta, and Iota a little less, but Beta, Delta, Zeta, and Eta do not. At Beta and Gamma is there a 1.0 point difference between the supply chain interface and the other two topics, while at Zeta and Eta the difference between output product-services and a combination of company capabilities and supply chain interface surpasses the value of 1.5. It shows that the bottleneck of servitization lies at the supply chain interface for the most advancing service companies, while at Eta and Zeta the capabilities are lacking as well. Future positions leads to augmentation of these values with a 2 point difference for Beta, and Delta. For Gamma, the supply chain interface becomes the bottleneck as well.

4.5 Conclusion

The aim of this chapter was to compare the cases within and across units of analysis in order to find out and argument the similarities and differences.

The cross-case analyze was used to test whether the theoretical framework would be in harmony with empirical evidence. From the case results, it could be concluded that most captured and analyzed data could be synchronized well with the constructs in literature for the items that were mentioned by past research. Full maintenance contracts as construct was deleted from theory as being vague and not delimited or distinctive. Other constructs like reliable product performance, being performance enabler, and co-development of services took already place in an earlier stadium, as was mentioned in past research. Thus, both the horizontal as well as vertical side of the framework is in harmony. One improvement was made by inclusion of product-services besides normal consumptive services. Furthermore, the co-marketing and sales services were argued to be different from product-oriented

services, however there was no problem with capturing them in the framework, since they are still consumptive services.

Another purpose was to test whether the case study data collecting and analysis were inappropriate or that Alpha dealers are lacking service determinants. It could be concluded that there was high similarity among cases and similarity with literature, excluding inappropriate case study data collection. What is left over is that some dealers lack service determinants or did not represent their company well in the interviews. In addition, the cross-case analyses could reveal underlying theoretical mechanisms or factors for execution of product-services. It could be concluded that several mechanisms were found in the cross-case analyzes.

The analyses were also meant to position each case in relation to each other and in relation to literature for their current and future position. When moving towards the future position on the servitization continuum, non-alignment among servitization variables is growing within companies. It could be concluded that this effect is caused by the fact that companies tend to give higher estimates to variables they expect to be able to fulfill easily, since they are already a professional in this area. This was supported by the current and future position on the framework, mentioned in an informal discussion meeting for validation of their position, and lack of attention to undervalued variables in the interviews. In addition, it is questionable whether Alpha's ambition to move two stages on the continuum in near future is realistic. Alpha is currently working in a reactive mode since they are in the middle between fulfilling demands of low and high level service companies. This mode is most profitable. It can be concluded that Alpha's ambition to servitize further can only be translated if product-service demands of high level service companies can be fulfilled as well. To minimize shortage or abundance of high level product-service qualities, Alpha should start with alignment of low and high level service companies and professionalize the supply chain interface to ensure cooperation. Otherwise, developed services will be non-effective to dealers. This means that the service paradox described by Gebauer, Fleish and Friedli (2005) will also become applicable in an interorganizational environment. Moreover, the future position expects an even higher non-alignment. Lastly, the results have shown that the supply chain interface is the main bottleneck to high level service companies. The cross-case analysis has excluded that this is due to being intercompany. However, Alpha's future product-services are only effective when the supply chain interface works quite well. Both dealers and Alpha are interdependent upon their servitization success.

Finally, sub conclusions are drawn for each variable of investigation, which can be found in the apart set of appendices as well as in appendix M.

The next chapter will describe how the new developed conceptual framework as improvement of the literature review was validated since any changes were still made by own opinion, even though as extraction from collected data.

5. Validation of case companies' position

The cross-case analysis has shown how cases are in relation towards each other and in relation towards literature. The results served as input for improving the initial theoretical framework. However, any changes made, even though supported by empirical evidence, were partially done in own opinion. This chapter will describe how the framework and position of case companies was further validated.

5.1 Type design

At the end of each interview, the respondent was asked to give feedback on the improvements made for them based upon collected data. After an initial outcome of the cross-case analyzes, respondents were asked to give their feedback on the setup, content, and current and future position on the theoretical framework. The framework would be valid on the first premise if respondents could identify themselves with it. It was desired to hold a general feedback session with all respondents over a visual communication platform. This could have led to discussions between respondents on opinions and better interpretation of the theoretical framework (Brookfield & Preskill, 2012). Nevertheless, this was not feasible, since it was hard to organize a central meeting due to busy agenda's and time zone differences. Hence, each individual respondent is asked to give their most objective opinion in an individual feedback session. At Alpha, a central meeting was held with all respondents. A second purpose of the feedback session was to increase the level or feeling being co-developer or make the solution more personalized (Prahalad & Ramaswamy, 2004).

5.2 Results

The results revealed that all respondents were satisfied with the setup of the theoretical framework. Some respondents had problems with interpreting key words as they are an abstraction of their own vision and thoughts. Where necessary, key words were further explained. This resulted in some changes made in describing key words. Most discussions were held about estimating the right current and future position on the continuum. Respondents were most struggling with themselves in making a self-reflection of their company. By probing some further questions and internal company discussion, these problems were alleviated and were they able to mark their positions. In discussions, discrepancies between the author's and respondent opinion were argued and eliminated. Conclusively, all respondents were satisfied with identifying themselves on the continuum and were exciting to use the framework in practice.

5.3 Conclusion

The results from the cross-case analyzes led to validation and inclusion of determinants on the initial framework. The current and future position of cases was determined as well. Nevertheless, these activities were done by the author's own interpretation. It can be concluded from this chapter that the new theoretical framework is validated by interpretation of the author and respondents after making some minor changes. Furthermore, all cases showed interest to adopt the framework in practice. Appendix T shows the end-result of the theoretical framework. The next chapter will present the conclusions and reflection on the master thesis.

6. Conclusions and reflection

This chapter will present the conclusions and reflection on the master thesis research study of inter organizational servitization in the supply chain context of Alpha and its product dealers. The study was conducted by synthesizing the latest knowledge from literature on servitization divided by the intra- and interorganizational perspective. The intraorganizational perspective was reviewed in order to check applicability of intraorganizational servitization at higher upstream companies in the product-service supply chain. After the literature review, a multiple embedded case study was used to further answer the research questions as part of giving answer to theoretical and practical gaps. This chapter starts with discussing and answering the research questions. Hereafter, theoretical and practical implications of the research study are given. In addition to implications, recommendations are given to Alpha about implementing the concept and it ends with describing limitations and options for future research.

6.1 Answers to the research questions

This paragraph will give answers to the research questions and deliverables of the research study. Together, they should be able to solve the main problem of Alpha, namely how they could better serve customer needs by moving towards a service-oriented company with multiple stakeholders.

RQ 1: What theoretical models or combination of models are present for traditional manufacturing organizations to make the shift to a more service-oriented organization?

Within the literature, authors use a wide range of terms for describing sub stages of servitization, ranging from product-service systems (PSS) which seem to be more focused on reducing the environmental impact of businesses, like the study of Tukker (2004) and Mont (2002), to use-oriented and integrated customer solutions. In addition, some authors propose matrix frameworks for servitization like Penttinen & Palmer (2007) and Windahl and Lakemond (2010) whereas others propose a continuum like Oliva and Kallenberg (2003). It became clear that the central purpose of every servitization study is to serve the customer to a higher stadium by fulfilling latent needs or needs that indirectly related to any product adoption. To minimize the use of abstract or vague overlapping keywords that have no direct link with fulfilling needs, the servitization continuum is introduced with three sub stages of execution. The central idea is that services are the driver behind fulfilling better customer needs. Customer needs can be fulfilled by dividing into three branches. The first branch is product- versus customer-oriented offerings. Product-oriented offerings fulfill the primary demands of customers and are generally sold to the customer by marketing the product properties or instrumental values. The secondary customer demands are fulfilled when the output of the offering satisfies pure customer demands or terminal values, the highest stadium of the means-end chain (Woodruff, 1997). The second branch is transactionship-based selling versus relationship-based selling. When offerings are sold by transaction, customer demands are only satisfied at the moment of purchasing. Customer demands change over time, due to changes in the internal and external business environment (Johnson, Scholes & Whittington, 2008). Besides that, the performance of some offerings can deteriorate over their lifetime. To minimize discrepancy over meeting customer needs over the long-term, companies should move towards relationship-based selling. The third branch is standard versus customized offerings. Offerings can be standard or customized. In the beginning of the industrial revolution, it was

only profitable to sell commodities. In the current era, technologies are developed to deliver offerings tailored to individual customer needs (Vargo & Lusch, 2004). This enables fulfillment of customer needs on all ends of the demand spectrum.

Literature is also vague about describing the characteristics of the type service offering and underlying company capabilities for each step. There was yet no conclusive or all-encompassing set of determinants per step. Therefore, the framework introduced the tactical marketing mix for distinguishing service offerings (Fahy & Jobber, 2012). Company capabilities were described by introducing the value chain concept of Porter and modify this towards a product-service or service-oriented company context (Weele, 2009; Porter, 1985). Field research was used to fill in gaps or unknown determinants of the service offering characteristics and capabilities. In particular, there was not much known about procurement of services and about the service offerings characteristics and capabilities for upstream supply chain companies.

Conclusively, research question one could be answered, since it is known in what steps a product-oriented company can move towards a service-oriented company and what determinants are critical to successful accomplishment of each step.

RQ 2: How can the supply chain be managed for products as well as services or product-services?

Within literature, steps were made very recently to investigate the supply chain for services or product-services. Companies mentioned that service supply chains are non-identical to product supply chain management. The study of Ellram, Tate & Billington (2004) and Wise and Baumgartner (1999) were setting out differences between product- and service supply chains. However, authors did not yet come up with a strategy or concept for designing a universal product-service supply chain and none of them linked supply chain management with making a servitization transition. The initial framework was a first draft of a universal design for a product-service supply chain and making a link with the servitization transition. This design was the first concept making a linking pin between the two different fields of research. The design composited of two elements: the supply chain configuration and management of the supply chain relationship.

The supply chain configuration distinguishes between five different modes of configuring the supply chain, namely growing organically, supply chain integration upstream or downstream, horizontal integration, outsourcing, and the hybrid form of partial outsourcing. For product-service supply chains, it became clear that three out of five modes are fitting well.

The management of the supply chain relationships was divided over four different type flows of how companies communicate with each other. Where in a product-oriented company the supply chain is mainly managed by the flow of products, is the service supply chain mainly managed by the flow of information, and the product-service supply chain mainly managed by the flow of information and products. Field research was used to fill in gaps or unknown determinants of the supply chain configuration and management of the relationship. In particular, there was yet no knowledge about whether and how the supply chain interface should evolve when being in a servitization transition. Moreover, field research in intraorganizational perspective gave insight how the type upstream services was linked and processed with the type downstream service operations. Consequently, it became clear

why determinants in the supply chain interface were critical for upstream as well as downstream service operations and could determinants be further improved.

Conclusively, research question two could be answered, since it is now known how the supply chain should be managed on each step when moving towards product-service or service-oriented organizations.

RQ 3: What is the current position of Alpha and its dealers on the product-service continuum and on the supply chain?

This question was answered by field research and by obtaining feedback on the theoretical framework. The case study method focused on retrieving knowledge on the variables of interest in the theoretical framework. Eight dealer companies were selected as being a representative sample of all Alpha dealers. The results revealed that in the current position does no company yet enter customer-oriented selling. On average, dealers are entering relationship-based selling. Most companies could be positioned between transactionship-based customized selling and the end stadium of relationship-based standard selling. In addition, there is in general good alignment among variables. Intercompanies are most advanced in the servitization transition, but it was excluded that this was caused by their different supply chain configuration with Alpha. Alpha's position is equal to the average position of dealers. Consequently, Alpha can be marked as being operating in a reactive or exploitative mode. On the supply chain configuration, dealers and Alpha could be marked well in relation to the service offering and capabilities. However, the dealer's position on the management of the supply chain relationships in terms of the four flows is much under the expected level for medium and high level service companies.

RQ 4: What is the desired position of Alpha and its dealers on the product-service continuum and the supply chain?

The desired position of Alpha and its dealers was answered threefold: by looking at the results from field research, by looking at the results from feedback obtained afterwards, and by looking at the difference between current and future desired position.

The results revealed that all companies except Zeta would like to go one step further on the product-service continuum, without real differences between being low or high level service company. This company has no future ambitions to develop their company. Some companies have a slightly higher ambition than others, what can be translated back to their historical or current position on the continuum. The level of alignment among variables tends to decrease when moving to future positions. Cases give higher estimates to variables they expect to fulfill easily, as they are already professional in this area. Alpha has high ambitions to servitize in future with moving almost two steps in the servitization continuum. Consequently, Alpha can then be marked as being proactive and in an exploratory mode. In that case, the Alpha culture should be turned as well. When being in this position, Alpha will be able to fulfill the servitization needs of the high level service companies. On the supply chain interface, dealers are willing to move as well, but they expect to move not as much as with intraorganizational variables, since they rely upon Alpha to move as well. The low current position of Alpha in relation to high level service companies affects this opinion.

RQ 5: How should interdependent companies (Alpha and its dealers) make the transition on the product-service continuum from an interorganizational viewpoint?

The developed theoretical framework accompanied with the interpretation of current and future position of case companies should give guidance on how the interorganizational servitization transition should be made. To give more specific guidance in terms of the time of execution, a road map is developed with a number of action points in time order. This road map is formalized in a recommendations protocol, which can be found in an apart set of appendices. A short version of this implementation plan will be described down below. Alpha as manufacturer was identified as the leading party in the supply chain context of creating climate solutions. Alpha should therefore guide the transition process of servitization, since dealers will be dependent upon Alpha's efforts. From this point on, the following steps should be executed over time:

- ✓ The first step is to turn the organizational culture from being exploitative to explorative or pioneering in servitization, because they are at the moment laying behind the position of some dealers on the continuum. Top management should therefore inspire, convince and reward employees with servitization efforts.
- ✓ The second step is to turn the supply chain culture from being product-oriented to service-oriented. Dealers will feel risky or not comfortable to make an own servitization transition, caused by inertia and the fear to make a fundamental organizational shift and the challenges of servitization (Mont, 2002). Top management and account managers should explain and convince to dealers what the benefits of a servitization strategy are for their company and that Alpha will initiate and take the major responsibility in this process.
- ✓ The third step is to reconfigure and restructure the supply chain interface. Services will only lead to a return of investment if they can be delivered from the manufacturer to the distributor. Therefore, the supply chain should be reconfigured in cooperation with the distributor. After that, it should be investigated how the relationship should be strengthened over time by fulfilling the determinants of the framework on the supply chain interface.
- ✓ The fourth step is to align internal characteristics of services and capabilities. Every company should start by fulfilling the determinants which are laying behind the general position on the continuum. The highest priority should be given to determinants which have the largest negative impact on the organization success within the stage you are present and less efforts to be made to fulfill this determinant. Naturally, capabilities should be professionalized sooner than service offerings, because it is stated that capabilities are a prerequisite for developing business (Johnson, Scholes & Whittington, 2008).
- ✓ The fifth step is to create a plan with stakeholders for aligning service practices within their company. This implies that it should be investigated what particular demands of stakeholders are and to what extent they align with the company. With servitization expertise generated from studying this research, a plan can be made that states what determinants should be accomplished by the stakeholder and to what extent support can be given with accomplishing these determinants.
- ✓ The sixth step is to create a plan with stakeholders for aligning the position on the servitization continuum in the supply chain context. This implies that it should be investigated what the

desired end stage is of the stakeholder on the continuum, how fast this end stage should be reached and what effects this has on providing assistance or making future investments by the upstream supply chain company. Based upon this information, a plan can be made that states what determinants should be accomplished by the stakeholder and to what extent support can be given with accomplishing these determinants.

- ✓ The seventh step is to complete future stages of the servitization continuum synchronically. This can be done like an iterative service development process (Papazoglou, & Van den Heuvel, 2006), illustrated in appendix U. Intercompanies can serve as pioneers for launching new types of support, without negatively affecting the partnership with independent dealers. Eventually, the supply chain will satisfy customer needs.

6.2 Practical implications

This chapter will provide the practical or managerial implications of the research study. Part of the study aim was to provide a guideline or solution to the problem statement within the Alpha context. Research questions were developed to find a solution to the problem. It should be noted that Alpha and dealers showed interest to adopt the solutions from the theoretical framework in their company to some extent. This leads to practical relevance or usefulness of the research, together with the practical implications mentioned down below (Shrivastava, 1987). The practical implications will specify what action points Alpha's management should take, after the master thesis research with implementation protocol are presented.

1. The first step for top management of Alpha is to start with turning the organizational culture from being exploitative to explorative or pioneering in servitization. Therefore, top management should inspire, convince, and reward employees that an interorganizational servitization strategy is the key to achieve future business success. The benefits of the strategy should be tailored to what is of interest for employees, which is similar to describing the value of a product or service to the dealer or end-customer. This can be for example safeguarding jobs, or higher future salaries. Top management can execute these tasks by holding a central presentation for all departments that are involved with making a product-service transition. Information from the master thesis study can be used as input source. This presentation should also include a strategy on how the servitization transition will be completed. This can be done by drawing a simple visualization from the developed theoretical framework and use the sub conclusions for each variable from the cross-case analysis as input for explaining the benefits of using each variable. After this presentation, line managers should give an extra presentation, to specify the impact of servitization on each department. Question and answers sessions should be held after these short presentations in order to check whether everybody is convinced about servitization. In addition, each department should visit in groups a company that has executed a servitization transition in the past, to let people believe that servitization is not just a fairy tale story.

2. The second step for Alpha is to take the leading role in turning the supply chain culture from being product-oriented to service-oriented. Alpha was found to be trusted and valued by dealers as the initiator of creating successes for everybody. Therefore, top management and account managers should inspire and convince other stakeholders that interorganizational servitization is the key to achieve future business success. This implies that the strategic, marketing, and financial benefits of the strategy should be presented and most preferably tailored to the benefits for the dealers. The theoretical framework already specifies what the value of product-service is for dealers on each stage of the continuum. Furthermore, they should explain how this strategy can be completed. Alpha can execute these tasks by visiting each dealer independently with a delegation consisting of a member of top management and a country manager. A presentation should be held for the top management of the dealer company. This presentation should also include a strategy on how the servitization transition will be completed. The presentation should be tailored to the specific situation of the dealer. It should enlarge existing problems and it should make clear how servitization will be the solution to these problems or challenges. The individual sub conclusions about each case in the within-case analysis can be used as input source. In a question and answer session, residual worries or uncertainties should be answered by using knowledge about each case from the master thesis. It is advisable to use first an intercompany and after that a well-known value added partner as option to pioneer with this process. An intercompany is part of Alpha, so eventual mistakes do not lead to termination of the relation. Care should be taken with explaining in detail how each stage will be accomplished. It could deter dealers from joining Alpha's vision. For example, if dealers will know beforehand that servitization will lead to long-term partnership contracts, they could get suspicious thoughts about the actual purpose of the strategy.
3. The third step is to start with reconfiguring the supply chain interface. This implies that Alpha should specify in detail what elements are part of a simple or advanced trading contract. It should be clear what the purpose is for rights and duties within this contract and to what extent rights and duties should be deleted, modified, or added. The simple trading contract should therefore be used as threshold for selecting new candidate dealers with future potential; otherwise any efforts in supporting this dealer will be worthless. Both contracts should cover all the liabilities on risks and successes that are related to communication and delivering product-services to dealers. It is advisable that Alpha will make a time plan for when dealers should sign new contracts, without having much negative effects on existing company results. This means that gradually less resources and time should be spend on dealers that are not worthwhile to invest upon, and more resources should be spend on dealers with future potential. The research has made clear that Alpha should insert articles on the territory of operation in terms of geographical region, product type, and customer type. These types of segmenting dealers should be made metric or measurable as possible in order to prevent any ambiguousness. Furthermore, dealers have mentioned that the differences between a simple and more advanced trading contract (VAR versus VAP) are too few, meaning that the cost-benefit trade-off for dealers is too small. One important item mentioned by dealers is that the price difference for products should be increased.

4. The fourth step is to restructure the first part of the channels for managing a relationship with a dealer. Alpha should start with accomplishing the common problems related to determinants for the eight companies of investigation. The determinant with the largest impact and the less efforts should be accomplished at first. The master thesis reveals that *'real-time or proactive responsiveness with the customer to minimize disturbances in ad-hoc requests'* should be accomplished at first. The information channel is most important for Alpha, and within this channel, this determinant is found to be easily accomplishable. In addition, it is a determinant what could lead to faster follow-up on some projects for dealers so that more time will be spend on acquiring new projects. Alpha can accomplish this determinant by giving updates on product-service production and delivery as fast as possible. For sales support and country managers, it does imply that emails and telephone calls should always be answered within a short agreed upon time period with an answer or an indication about the time that an answer can be given. A certain method or structure should be developed to minimize the time for giving follow-up answers based upon experience.
5. The fifth step is to continue with solving common problems in the information channel, taking into consideration that there is a certain commonality between determinants. This can be done by drawing up a list of commonalities among determinants, find the determinant that has the most commonalities, and identify how determinants can be made easily adaptable for being implemented in this determinant in near future. The determinant advanced information system or virtual work platform can be used as medium for implementing other determinants easily. Although it takes much effort to develop a virtual work platform in the sense of making an extension to software program Y, determinants should be accomplished by taking into account that the determinant should be made ready or compatible for future implementation on the virtual work platform. For example, the common determinant *'use of standard formats'* should be developed in a database program. A database program is an ideal software application from which data can be extracted for use in the new virtual work platform.

In summary, the five managerial implications are a good starting point for implementing the results of the master thesis within the Alpha supply chain. Further guidance should be sufficient by following the implementation protocol and completing step for step all determinants within each stage on the continuum.

6.3 Theoretical implications

This chapter will provide the theoretical implications of the research study. One part of the study aim was to provide new scientific evidence to fill in theoretical gaps found in literature. In particular, the topic of interorganizational servitization has received less attention for the past years. The theoretical implications are embedded into a central framework, argued with interpretive data analysis from a substantial amount of empirical evidence, which are criteria for rigorousness of research (Shrivastava, 1987).

Firstly, literature mentioned theoretical models for making the transition to product-services. However, models were found to be vague, overlapping, less detailed, and thus of less relevance. The new theoretical framework was developed to be used as a universal approach in transitioning from a product-oriented to a service-oriented organization. The framework describes the transition in detail with eight stages, a clear non-disputable delineation between stages, and unambiguous constructs. Even more, it was concluded in the cross-case analysis that the newly developed theoretical framework is in quite well harmony with empirical evidence since it only deviates from a few determinants. As a result, the framework is a good representation of reality, which is a criterion of rigorousness of research (Shrivastava, 1987). The first theoretical implication is therefore the provision of a clear, unambiguous, universal and reality-representative intraorganizational servitization framework.

Secondly, extant research has put attention to describing the service offerings within each sub stage of the servitization transition. However, it was not criticized what should be essential service offering characteristics and what not. As a result, the soundness of the past models to guide the transition is low. By using the tactical strategic marketing planning cycle for services, essential characteristics of services were delineated that should be determined with the launch of any offering (Fahy & Jobber, 2012). This has led to new properties of service offerings in horizontal stages of the continuum like the customer segmentation matrix. The second theoretical implication is therefore the provision of a set of essential service offering characteristics.

Thirdly, extant research has mainly focused on the sub stages of servitization, but it did not specify in detail the capabilities required for accomplishing each sub stage. Past models are therefore of less relevance, because only the different stages of the continuum are described, not how stages can be accomplished. By using the universal capabilities for any company as specified by the value chain of Porter and adapt that to servitization, determinants could be found for stages on the continuum. In particular, procurement of services was seen as a gap and could partly be resolved. The third theoretical implication is therefore the provision of instruments for the production of the required service offerings per stage.

Fourthly, it was yet unknown in academic literature whether upstream service suppliers in the supply chain should move to servitization as well, and whether or not in the same manner. Without this knowledge, servitization transition models cannot be applied to upstream service suppliers. The newly developed theoretical framework showed that intraorganizational servitization is different from upstream versus downstream service suppliers. It is associated with the role of being in the frontline or backend of service operations. Consequently, upstream suppliers are less involved in giving (customized) service offerings, being responsive to solve dissatisfaction, and solving customer needs by analyzing their situation or problem. Upstream suppliers do on the other hand assist more in back-end operations.

This has led to the development of a new primary supply chain for services, and differentiating between four types of services. The fourth theoretical implication is therefore a division between the servitization transitions for upstream versus downstream service suppliers.

Fifthly, extant research did barely focus attention on how to organize servitization transitions in a supply chain context with multiple companies. It was found that collaboration with other companies is sometimes a must to achieve a minimum service performance (Gebauer, Paiola, & Edvardsson, 2010). The newly developed theoretical framework differentiated between supply chain configuration and supply chain relationship management. After the configuration is settled between up- and downstream companies, the relationship can be strengthened by using four different type channels. Each stage on the continuum belongs to another type configuration and supply chain relationship management. Even more, it was concluded in the cross-case analysis that the newly developed theoretical framework is in quite well harmony with empirical evidence, since it only deviates from a few determinants. As a result, the framework is a good representation of reality, which is a criterion of rigorousness of research (Shrivastava, 1987). The fifth theoretical implication is therefore the provision of an interorganizational servitization framework that represents reality.

Sixthly, the fifth theoretical implication can also be viewed as the linking pin in merging the scientific research topics of servitization and supply chain management. Extant research did study both topics individually. However, when both topics could be studied in a cross-over, this could lead to knowledge that is complementary. The results of this study presented a bridge that enables cross-over research. The sixth theoretical implication is therefore the provision of a link that connects the research topics of servitization and supply chain management.

In summary, the six theoretical implications take away confusion in academic literature among the different theories, terms, and constructs related to servitization, the lack of knowledge about the characteristics of service offerings and how they should be produced, the question whether servitization processes are different between upstream versus downstream operating companies in the supply chain, and how these companies could collaborate, even though their servitization process is different. Even more, the results enable cross-over research between two research fields, which can probably generate answers on research questions as well as options for future research.

6.4 Limitations and future research

This chapter describes the limitations of the research study. It shows the concerns readers should take into account for right interpretation and usage of the knowledge uncovered and future research options for further validation of findings and new interesting research directions. For getting an overall image of the validity and reliability of the research adapted from Yin (2013), excluding limitations, an appeal can be done on appendix V.

The first limitation is that field research only consisted of Alpha as upstream supply chain company. The limited time of the study made it impossible to research other upstream supply chain companies. The amount of the selected key respondents was higher in this case to increase construct validity. Besides that, the information retrieved from the second unit of analysis could be used for validation of the first unit of analysis. On the opposite, on the second unit of analysis was a large amount of cases selected. Further research should further validate the findings of the first unit of analysis.

The second limitation is that due to time limitations, the choice has been made not to research lower upstream companies than Alpha. The findings on interorganizational servitization are therefore not applicable for the full supply chain. Further research should investigate the lower upstream supply chain to get a more comprehensive image about product-service supply chains.

The third limitation is that due to time limitations, the choice has been made not to research the effects of service operations at each stage of the continuum on customers of Alpha dealers. Field research incorporated the effects from service operations from the eyes of the dealers, but not independently from the customers. Further research should find out how customers perceive the service offerings and to what extent the servitization strategy is applicable or should be adjusted.

The fourth limitation is that the newly developed theoretical framework does not contain enough determinants on all sub stages and variables. Even though it fulfills the Alpha needs in the medium-term, it cannot completely fulfill the Alpha needs for the long-term. Even more, the framework is not yet complete to be generalizable and applicable in other industries or supply chains. Future research with high level service companies could lead to new empirical evidence for new determinants that should complete the framework. The determinants belonging to the future desired position could serve as starting point of departure.

The fifth limitation is that purposive sampling was used with snowballing for the literature review due to time constraints. Potential interesting past research results could probably have been overlooked. A more extensive literature review could capture a wider range of articles that treat the topics of servitization or supply chain management for product-services.

The sixth limitation is that the case study research design was cross-sectional, meaning that it recorded the position of cases on one moment in time. It was assumed that each case will reach the same position of other cases in time in the same manner. However, this could not be validated. A longitudinal study on cases making a servitization transition could validate the assumptions made.

The seventh limitation is that no weight could be given to the extent that topics or variables affect the servitization success. It is for example possible that the information capabilities are more important to possess than control and planning. This can be further detailed by giving a weight on individual determinants. Further quantitative research could give insight to the importance of topics, variables, and determinants.

The eighth limitation is that the research was executed by own person by means of observations, within-case, and cross-case analyzes. It is possible that the data collection and analyzing processes are subject to human errors. Future research should reanalyze the collected data to exclude such errors.

Further research could broaden the cross-over knowledge between the two topics of servitization and supply chain management. The exploratory nature of this study depicted several topics that are interesting for further research. It could reveal new links on different variables of interest. For example, it would be interesting to get more insight in the differences of procurement of services versus products, and the (dis)advantages of using a certain supply chain configuration for a service-oriented versus product-oriented organization. The results from this study could be used as starting point of departure.

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Appendices

Appendix A Product flow case Alpha

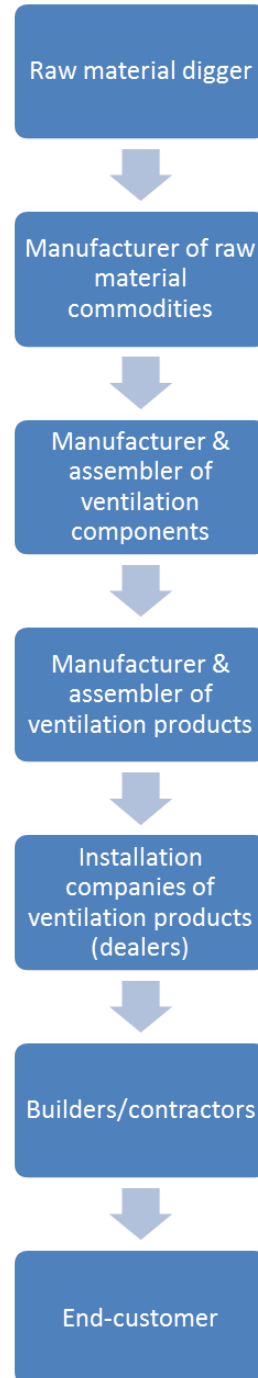
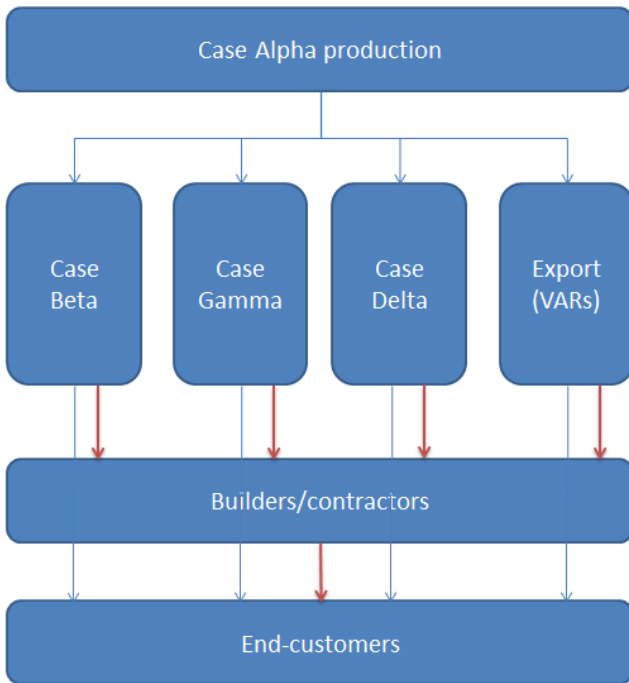


Figure 4 Product flow case Alpha and complete supply chain (Alpha, 2015)

Appendix B Organizational chart case Alpha

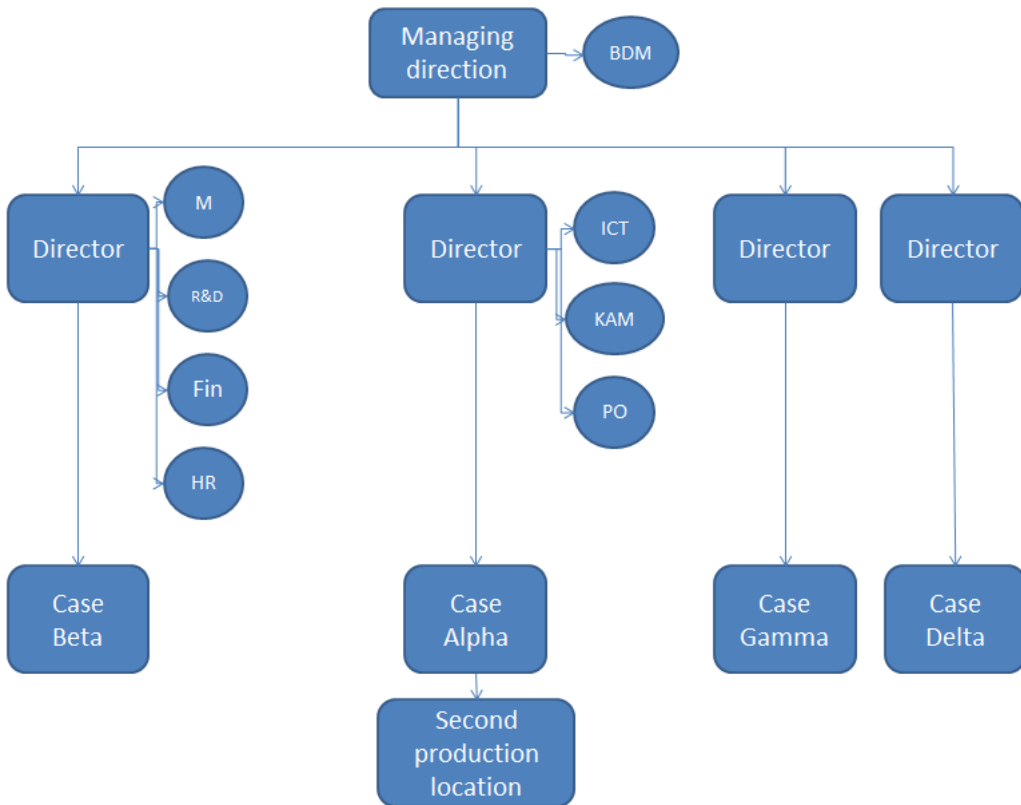


Figure 5 Organizational chart case Alpha (case Alpha, 2015)

Appendix C The research-design-development cycle

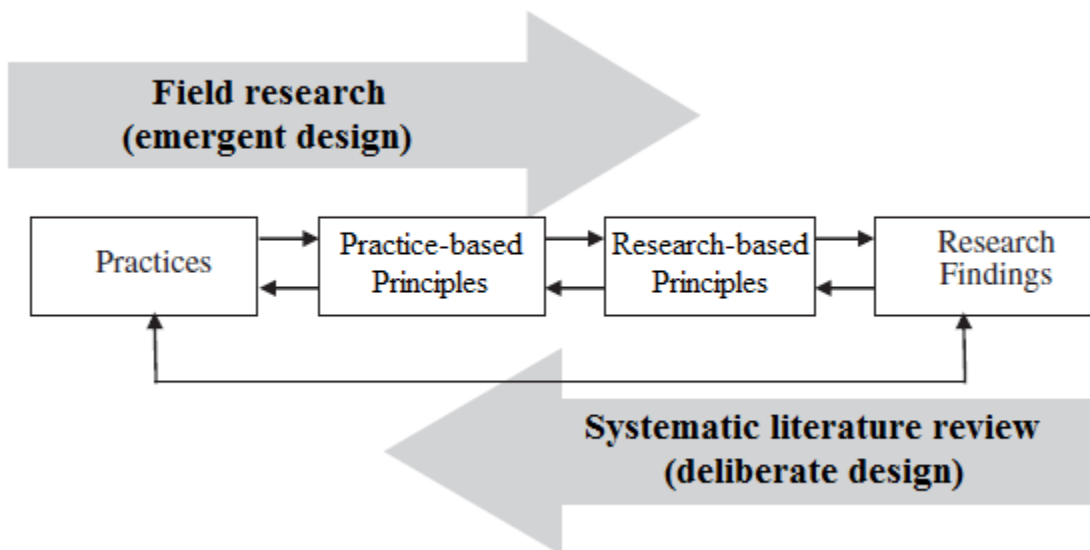


Figure 6 The research-design-development cycle (Van Burg, Romme, Gilsing, Reymen, 2008)

Appendix D

Systematic review architecture

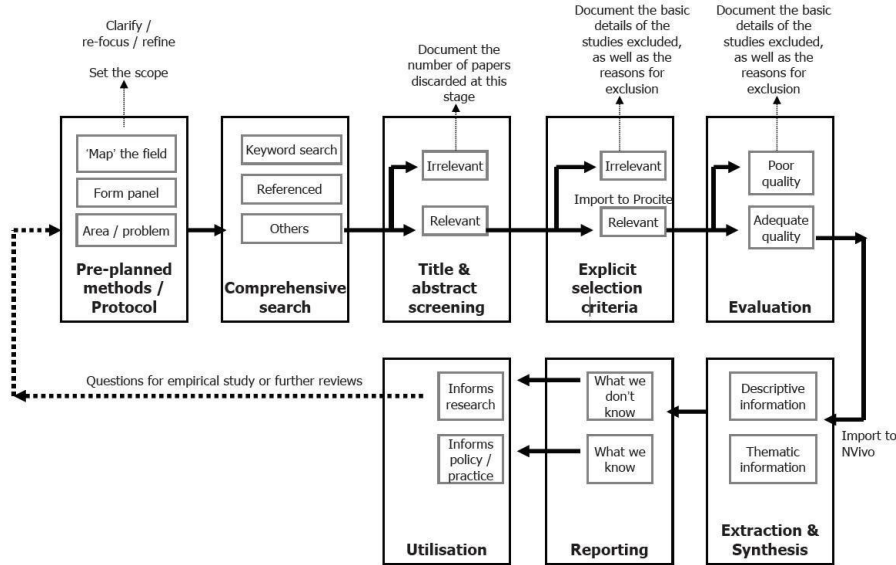


Figure 7 Systematic review architecture (Denyer, Tranfield & Van Aken, 2008)

Appendix E List of specific keywords

Customer-oriented services, product-oriented services, transactionship selling, relationship selling, standard services, customized services, front-sale services, after-sale services, pre-sale services, post-sale services, product-service AND value, product-service AND paradox, customer segments AND product-service, product-service AND marketing, product-service AND pricing, product-service AND ownership, product-service AND quality, information systems AND product-service, knowledge AND product-service, financing AND product-service, control AND product-service, planning AND product-service, organization AND product-service, organizational structure AND product-service, infrastructure AND product-service, protocol AND product-service, process AND product-service, human resource management AND product-service, motivation AND product-service, skills AND product-service, NSD, new service development, service AND procurement, product-service AND procurement, purchasing AND product-service, system integrator, integrated AND product-service, horizontal supply chain integration, organic growth, organic growth AND service, upstream integration, downstream integration, vertical supply chain integration, partial outsourcing AND product-service, strategic relationship AND product-service, partnership AND product-service, service supply chain, product-service supply chain, supply chain relationship AND services, supply chain relationship AND product-services, customer relationship management AND product-service AND supply chain, information relationship management AND product-service, co-creating services, co-creating product-services, demand-supply management AND product-service, financial relationship management AND product-service, cash relationship management AND service, capital goods relationship management, sharing equipment AND product-service, sharing capital goods AND product-service, product-service delivery management, spare parts management

Appendix F Product-service continuum

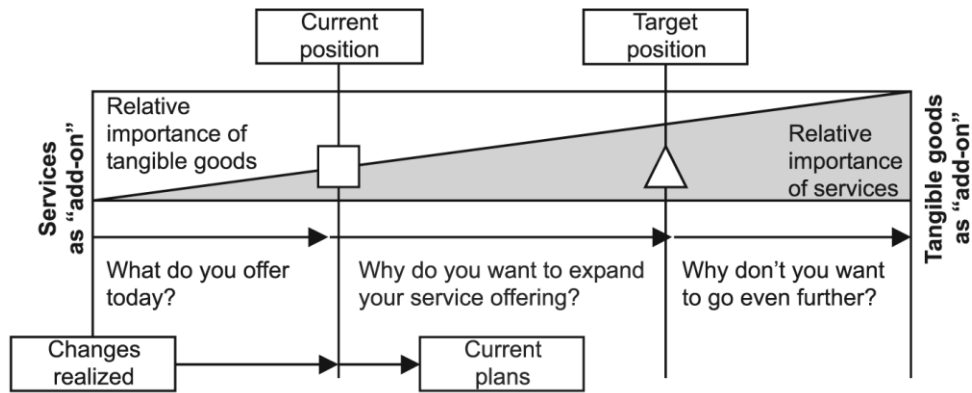


Figure 8 Product-service continuum (Oliva & Kallenberg, 2003)

Appendix G Value chain

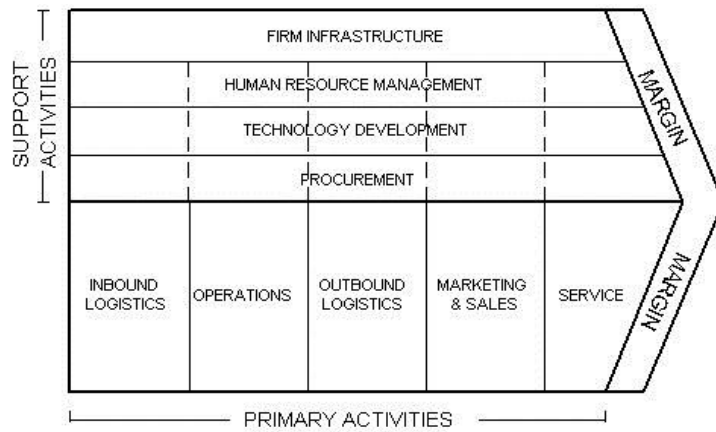


Figure 9 Value chain (Porter, 1981)

Appendix H

Service production process

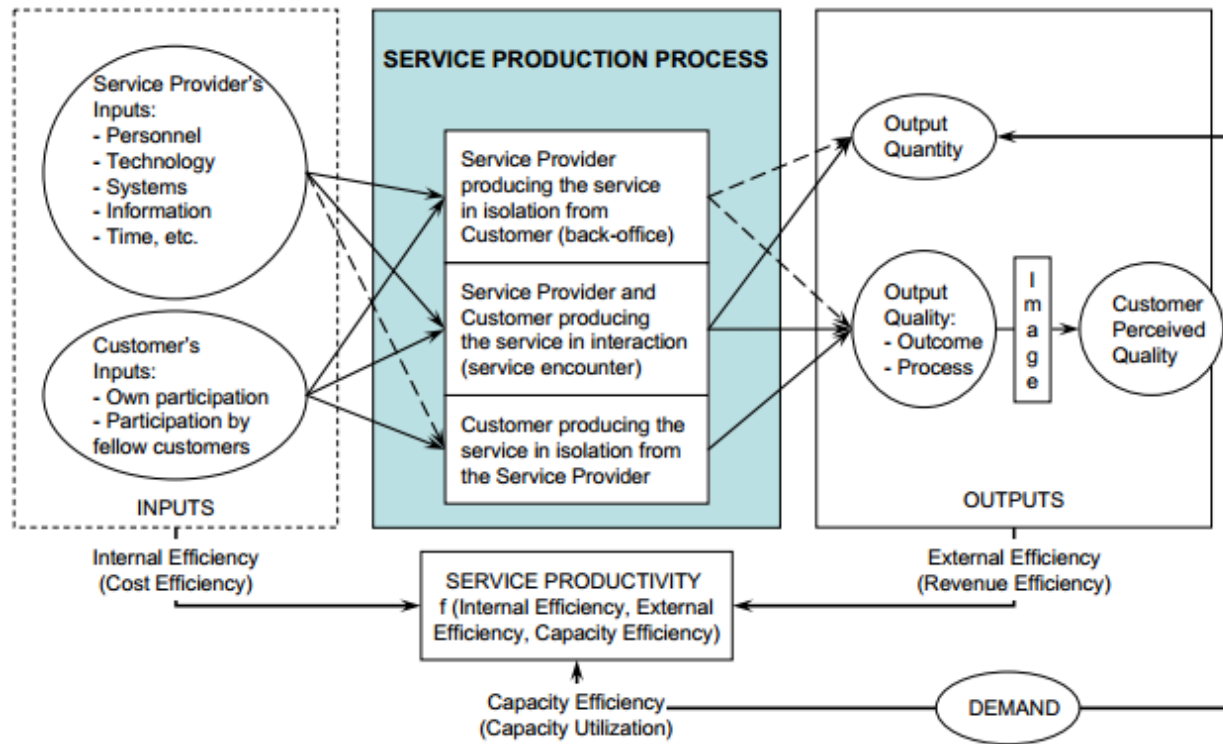


Figure 10 Service production process (Gronroos & Ojasalo, 2004)

Appendix I Theoretical framework interorganizational servitization (determinants included)

Outbound interface	Product-service continuum downstream distributor	Product dominant & service add-on						Service dominant & product add-on	
	Type orientation means-end chain	Product-orientation (use-orientation)				Customer-orientation (result-orientation)			
	Type orientation time	Transactionship-based		Relationship-based		Transactionship-based		Relationship-based	
	Type orientation setup	Standard	Customized	Standard	Customized	Standard	Customized	Standard	Customized
	Output product-services								
Front-sale services	<ul style="list-style-type: none"> Product documentation (1,2,5) Product transportation/logistics (2,5) Product installation/commissioning (2,3,5,7) Product demonstration (4) Detailed financial cost calculation (6) 	<ul style="list-style-type: none"> Product-project consultancy (documentation) (6,7,12) Providing product customization options/R&D-product engineering (3) 	<ul style="list-style-type: none"> Product trial service (10,12) 		<ul style="list-style-type: none"> Process or solution documentation (13) Insurance policies (11,12) 	<ul style="list-style-type: none"> Process-oriented engineering (tests, optimization, simulation) (5) Full project engineering Process-oriented R&D (5) Process-oriented consulting (5) Business-oriented consulting (5,12) End-to-end responsibility for installation, integration & coordination (7) Financial profitability consulting (9,14) 			
After-sale services	<ul style="list-style-type: none"> User product-training (5,7) Product service manuals (Safety) inspection/diagnosis (5,7) Spare parts (5,7) Reactive maintenance & repair (5,12) Product updates/upgrades/refurbishing (5,7) Recycling/taking-back service (5) Temporary warehousing (7) 	<ul style="list-style-type: none"> Hotline/(online) help desk (5,7) Customized evaluation of the project or product-service (13) 	<ul style="list-style-type: none"> Proactive/preventive maintenance (5) Remote monitoring/regular performance audits (5) Spare parts management (5,12) Full maintenance contracts (5) Product warranty (7) Capital financing service for product (6,7) 	<ul style="list-style-type: none"> Customized product software (19) Regular reporting of product functioning (9) 	<ul style="list-style-type: none"> Start-up assistance (7) Work instructions (9) Replenishment service by monitoring buying pattern (17) 	<ul style="list-style-type: none"> Process-oriented training (5) Business-oriented training (5) 	<ul style="list-style-type: none"> Capital financing service/mortgages (6,7) Managing maintenance function (5) (17) Performance guarantees/performance responsibility on operations or process output/pay-per-use (6,7) 	<ul style="list-style-type: none"> Asset management (7,15,16) Making production line planning Regular reporting/meetings (9) Procurement of third-party service providers (18) Administrative support (7) Crew management (7) 	
Value of services by customers	<ul style="list-style-type: none"> Reducing product adoption risks/proper functioning (20,25) 	<ul style="list-style-type: none"> Freedom of choice in services (21) 	<ul style="list-style-type: none"> Reliable product performance and availability (17) 	<ul style="list-style-type: none"> Freedom of choice in services over a long term (21) 	<ul style="list-style-type: none"> Relieving business-related tasks or uncertainty (22) 	<ul style="list-style-type: none"> Having an integrated solution that is compatible with other systems (23) 	<ul style="list-style-type: none"> Having state-of-the-art process (24) Guarantees of running operations (7,25,26) 	<ul style="list-style-type: none"> Getting tailor-made assistance in operations (27) 	
Value of services by the company	<ul style="list-style-type: none"> Services are an essential part of total value creation (18,28) Serve as reliable trouble-shooter (18) Aid the buyer in product adoption (20) 		<ul style="list-style-type: none"> Serve as performance enabler by assuring product functioning over time (17) Increase customer revenues/stable cash flow (28) 	<ul style="list-style-type: none"> Obtain customer feedback as input for R&D (31,32) 		<ul style="list-style-type: none"> Create a profitable end-to-end solution (33) 	<ul style="list-style-type: none"> Co-production of services to create value (7,8) Serve as trusted company (1,18) Let customers profit from latest developments (34) 	<ul style="list-style-type: none"> Customers benefit directly from supplier development competencies (25) Sustainable competitive advantages with tailored service offering (30) 	
Type customer segmentation	<ul style="list-style-type: none"> Customer is self-reliant, keeping full-control over the business from end-to-end by minimizing upfront risks (7) 						<ul style="list-style-type: none"> Customer is focused on core business and daily operations with risks and responsibilities and low competitive advantages are outsourced (35) 		
Service marketing & distribution	<ul style="list-style-type: none"> Add-on services get individual marketing attention (5) Services are mainly marketed by regular marketing/promotion (36) Sales people are the central distributor of services (37) 		<ul style="list-style-type: none"> Field service engineers and account managers are delivering services continuously (28) 				<ul style="list-style-type: none"> Operation engineers and key account managers are managing the partnership relation continuously (37) 		
Service pricing	<ul style="list-style-type: none"> Customer ownership of equipment (26) Services are free or separately priced (5) 		<ul style="list-style-type: none"> Customer ownership of equipment (26) TCO are priced in fixed SLA-contracts with product and service priced separately (15) Pricing is customized over customers (15) 		<ul style="list-style-type: none"> Customer ownership of equipment (26) Products and services are priced as one integrated solution (38) 		<ul style="list-style-type: none"> Supplier ownership of equipment (26) Customer pays of performance, product and services priced in one package (39) Sometimes is the product separately leased or rented (12,16) 		
Service quality control	<ul style="list-style-type: none"> Quality norms for products and services (32) 		<ul style="list-style-type: none"> KPI indicators with measurement tools for maintaining quality (7) Customer-satisfaction surveys (32) Product performance guarantees (26) 				<ul style="list-style-type: none"> KPI-indicators focused on customer value or performance (17) 		

Operations/process		Firm capabilities (secondary support activities)			
Instruments	Information	<ul style="list-style-type: none"> Supplier and customer work with independent information systems (34) Internal software suites operate on stand-alone (17) Firms share information related to product functioning on reactive basis (34) Firms acquire knowledge for producing services (32,34) 	<ul style="list-style-type: none"> Company and customer work with independent information systems with synchronizing features on product information/operational linkages (34) Data from internal software suites are shared regularly internally (17) Continuous sharing of project-related information on proactive basis (32,34) 	<ul style="list-style-type: none"> The customer provides process-related information about the business (32,34) The company is able to analyze a variety of customer information (32,34) Data from internal software suites are analyzed heavily by data-mining (32,34) 	<ul style="list-style-type: none"> Information systems are integrated (17,34) Internal software suites are integrated (17) Customer information will be analyzed together with internal data and turned into direct actions at customers' sites (32,34) Cooperative norms for sharing automatically information (32)
	Finance	<ul style="list-style-type: none"> Build up working capital for successive servitization stages (40) Employee rewards/licenses should be adapted (31) Developing financial incentives for product-service adoption (41) 	<ul style="list-style-type: none"> Financial reserves for unexpected penalties (42) Cash flow management will become easier with service contracts (16) Customer due diligence by data-analysis (43) 	<ul style="list-style-type: none"> Investments in diverse new type assets/expert people (43) Accounting competences in non-product related activities (43) Ability to assess new service development risks/success (16) Competences in financial customer services (43) 	<ul style="list-style-type: none"> High working capital fund for providing product leasing/partnering with financial institution (42) High working capital fund for service co-development (42)
	Control & planning	<ul style="list-style-type: none"> Setting up model for protecting assets, knowledge, and other business advantages (43) Replenishment systems keep track of resources input and output (44) Formal contracts with customers and suppliers (44) 	<ul style="list-style-type: none"> Trading protocols (8) Clear job and function licenses (45) 	<ul style="list-style-type: none"> Project management techniques (44) Individual planning expertise (44) 	<ul style="list-style-type: none"> Flexible contract with the customer (44) The level of product-service customization is set in relation to planning complexity (46)
	Organizational (infra)structure & process	<ul style="list-style-type: none"> Service operations as apart business unit (5,15) Service agents geographically with ethnocentric infrastructure (47) 	<ul style="list-style-type: none"> Setting up flat horizontal business structure (48) Service blueprints structure work tasks (45,51) Local service units with liabilities at headquarters; polycentric integrated infrastructure (47) 	<ul style="list-style-type: none"> Service configurator module that integrates service components for individual customer needs (52) Local service units with own liabilities and control; polycentric separated infrastructure (47) 	<ul style="list-style-type: none"> Business infrastructure is horizontal flat with contingency modes to react with a flexible and pragmatic approach (49) Local service units and headquarters operate in synergy of liabilities with geocentric infrastructure (47)
	Human resource management	<ul style="list-style-type: none"> Start with pilot service projects and show its success (53) Intrinsic motivation or willingness to succeed at the customer (54) Technical adeptness (32) Being flexible and agile/resilience (32) Problem solving attitude (32) 	<ul style="list-style-type: none"> Customer relationship management and communication skills (55) Ability to listen/monitor/obtain customer feedback (32) 	<ul style="list-style-type: none"> Work crafting behavior (56) 	<ul style="list-style-type: none"> Key account management skills (55) Authenticity (32) Being a liaison between customer and suppliers (32) Networking competences (32)
	Service development	<ul style="list-style-type: none"> Rigid and structured new product development methods are dominant (28) Pioneering with service development by integrating and using the input of both front-and back-end operations; craft-batch type (11) 	<ul style="list-style-type: none"> Developing formal guideline for service development while upscaling the innovating capacity; mechanistic bureaucracy type (11) 	<ul style="list-style-type: none"> Flexible ad-hoc development of services; organic technical-batch (11) Outsourcing specialized service development tasks (11) 	<ul style="list-style-type: none"> Continual development of ad-hoc services based on experience; hybrid mechanistic-organic type (11) Co-development of services with customers and suppliers (11)
Service procurement	<ul style="list-style-type: none"> Purchasing by embedded innovation; purchasing is product-centric and sometimes standard services are bought (19) 	<ul style="list-style-type: none"> Purchasing by solution; more external expertise is hired and in-depth knowledge is shared as input for the supplier (19) 	<ul style="list-style-type: none"> Purchasing by aggregation; service expertise from many third-parties are bought and aggregated (19) 	<ul style="list-style-type: none"> Purchasing by synergy; product-services are bought, and aggregated, but also able to combine and analyze data in the same format (19) 	
Supplier consumptive product-services/input	Supplier productive product-services/input	Inbound interface			

		Supply chain interface			
Supply chain configuration				Becoming system integrator	
				• Introduction of simple integrated systems or set of semi-integrated complementary products (58)	• Introduction of advanced integrated systems (58)
		Organic growth			
		Upstream integration of exclusive capabilities			
		Downstream integration of distributors			
	Strategic partnership between manufacturer and seller (partial outsourcing)				
Supply chain relationship channels	Information	<ul style="list-style-type: none"> • Creating heterogenous set of customer installed base to minimize fluctuations in service needs (59) • Increase customer loyalty and trust by forming the relationship with in-depth assessment of company profile, open communication, high responsiveness, and tailor-made solutions because of differences in culture or country (60,61,62,63) • Real-time or proactive responsiveness with the customer to minimize disturbances in ad-hoc requests (65) 	<ul style="list-style-type: none"> • Balance backlogs of service demands to minimize order batching effects in terms of information processing (59) • Forecasting future service demands and specifications of demand to minimize bullwhip effects of higher frequency and amount of information by services and to minimize the probability of product-service rework (66) • Virtual work environment as extranet for co-creating services (64) • Creating an interface for obtaining feedback and input from stakeholders (64) 		
	Cash	<ul style="list-style-type: none"> • Minimize price fluctuations to minimize fluctuations in market demand by pricing (66) • Alternative measurement tools to controlling the quality of service outcome and consequently the conditions for payment (67) • Uncertainty modeling by application of probability theory because of increasing risks in accounts receivable with ser vitzation practices (68) 	<ul style="list-style-type: none"> • Alternative payment model with timing, interval, and amount to increase and balance cash flow or work capital of downstream service provider (69) 	<ul style="list-style-type: none"> • Openness of finances in supply chain partnerships to stabilize and control risks in service development and operations (70) • Collaborative risk-based pricing method for co-development of services (71) 	
	Capital goods	<ul style="list-style-type: none"> • Agreements on work behavior, work requirements (73) • Capital goods should be made transportable and ready to be shared with the customer (72) • Cross-training of employees on contingent situations (74) 			<ul style="list-style-type: none"> • Serve as distribution or pooling centre for sharing capital goods between multiple service providers (75,76)
	Product & spare parts	<ul style="list-style-type: none"> • Adaptation of logistic function to fast delivery of spare parts (77) • Adaptation of the logistic function for bidirectional flow of products (50,57) 	<ul style="list-style-type: none"> • Higher inventory buffer level to buffer the randomness of service encounter failure (29) 	<ul style="list-style-type: none"> • Ability to identify and calculate with a complex network of transportation nodes (60) 	

Table 3 Theoretical framework (determinants included)

Appendix J List of potential dealer respondents (color green is selected)

Distributor/ dealer	Type partnership (VAP/VAR)	Company size in level of order intake (x €1000)	Share of wallet (part of revenues via case Alpha instead of competitors)	Partially in- house production	Country	Multiple partners in country (yes/no)	Main customer sector (industry/commercial)	DMU: ratio of orders via contractors/end- customer (%)	Service and maintenance level in front-and after-sale stadiums (small/medium/large)
Case Beta	VAP	X	100	no	Netherlands	no	C	90	large
Case Gamma	VAP	X	100	no	Belgium	no	I/C	80	large
Case Delta	VAP	X	100	no	Great-Brittain	yes	C	100	large
Case Epsilon	VAP	X	100	no	Great-Brittain	yes	I/C	90	small
Case Eta	VAP	X	100	no	Ireland	yes	C	90	medium
Case reserve 1	VAP	X	90	no	Italia	no	I/C	80	medium
Case Zeta	VAP	X	100	no	Germany	yes	I	0	medium
Case Iota	VAR	X	100	no	Country in Asia	no	I/C	90	small
Case Theta	VAR	X	100	no	Malaysia	no	I	80	small
Case reserve 2	VAR	X	80	no	Ireland	yes	C	90	small
Case reserve 3	VAR	X	20	no	United Arabic Emirates	no	I	90	small
Case reserve 4	VAR	X	10	no	Great-Brittain	yes	C	100	small
Case reserve 5	VAR	X	70	yes	Germany	yes	I	80	small

Table 4 List of potential dealer respondents (Case Alpha, 2015)

Appendix K Interview guideline

Semi-structured interview guideline case Alpha

General information respondent

- Name of respondent:
- Function and speciality:
- Department:
- Date of interview:

Interview preparation with respondent

- Make the respondent comfortable with you by having an informal conversation and start with describing the assignment shortly and the purpose for you as for him/her so that collaboration is ensured. Tell the respondent about the level of confidentiality.
- Explain why you take this interview with the respondent. Explain what you are going to ask roughly and why and how he/she is expected to give answers. Ask the respondent permission for audio recording and the time for taking the interview.
- Explain that the interviewer can act different from his own personality to be most objective in asking the question.
- Explain the interviewee the option to adapt his behavior in favor of giving the most complete and right answers to his/her opinion (turning the eyes away from the interviewer).

Determination of the current position on the product-service continuum

Service offerings to the customer

1. What kinds or types of services do you deliver to distribution partners in the front-sale stadium?
2. What kinds or types of services do you deliver to our distribution partners in the after-sale stadium?
3. Why are these services delivered, what is the purpose for the partner?
4. Why are these services delivered, what is the financial purpose for you in terms of cost/benefits, eventually per type service?
5. Differences in who receives the type of service (customer segments)?:
 - a. Level of order intake
 - b. Type industry
 - c. Country
 - d. Share of wallet (ratio of order intake case Alpha/competitor of case Alpha)
 - e. Average service and maintenance level in front- and after-sales
 - f. Type partnership
 - g. Ratio of orders via contractors/end-customer
 - h. Producer of ventilation
6. When do you deliver services (type relationship)?
7. Where do you deliver services (how are they marketed and who distributes them)?
8. How do you deliver services?:
 - a. How do you price services (per time function/fixed contract/per performance delivered)?

- b. How do you keep control of the service quality (measurements, corrective action, SLA-responsibilities)?

Capabilities for delivering services

1. What do you need to deliver these services and do you assist your partner with it?:
 - a. Company infrastructure (Information management, finance systems, control & planning, and organization structure (structure, process, infrastructure))?
 - c. Human resource management (motivation, skills)?
 - d. Technology development (methods, co-development)?
 - e. Procurement (what and how is the procurement process)?
2. What do you miss in capabilities?

Relationship to the dealer

1. How do you think is the current relationship with our distribution partners (probe: what about the configuration with independent partners and multiple partners per country)?
 - a. What are you and the partner satisfied about (benefits/advantages)?
 - b. What are you and the partner problems about (costs/disadvantages)?
2. How do you manage the relationship with partners?:
 - a. Information management (send/receive, interpretation, processing & dissemination in organization)?
 - b. Cash flow management?
 - c. Capital goods management/sharing (equipment, people, machines, facilities)?
 - d. Product delivery management (spare parts and taking back service)?
3. What do you miss in managing the relationship?

Determination of the future or desired position on the service continuum

Service offerings to the customer

1. What kinds of services would you like to offer in the future (why)? What strategy do you use?
 - a. What services do customers want you to offer in future (why)?
 - b. Ask eventually idem questions from current position

Capabilities for delivering services

1. What do you need to deliver these services and do you assist your partner with it?:
 - a. Ask eventually idem questions from current position

Relationship to the partner

1. What would be the most ideal configuration of relationship to have with your partners, the current one or different (five configuration options, why)?
 - a. What will be you and your partner satisfied about (benefits/advantages)?
 - b. What will be you and your partner problems about (costs/disadvantages)?
2. Did you get feedback from partners about your position, their goals, and where there are deficits (results from questionnaires)?

3. How do you think to manage the relationship with partners when you offer new services?:
 - a. Information management?
 - b. Cash flow management?
 - c. Capital goods management (equipment, people, machines, facilities)?
 - d. Product delivery management (spare parts and taking back service)?
4. Is the way you manage the relationship different per partner (idem customer segmentation questions from current position)?

Evaluation

1. Do you have other questions/comments/remarks/ideas?
2. Are you open for another interview a later moment in time for giving feedback on improvements made (why or why not)?
3. What did you like about this interview, what not?
4. Would you like to provide additional company information related to the answers you gave in this interview?

Semi-structured interview guideline second unit of analysis

General information respondent

- Name of respondent:
- Function and speciality:
- Department:
- Date of interview:

- Order intake from case Alpha (2014):
- Country:
- Main customer sector (ratio industry/commercial):
- Share of wallet (ratio of order intake case Alpha/competitor of case Alpha):
- Type partnership (certified partner/value added reseller):
- Ratio of orders via contractors/end-customer:
- Producer of ventilation:

Interview preparation with respondent

- Make the respondent comfortable with you by having an informal conversation and start with describing the assignment shortly and the purpose for you as for him/her so that collaboration is ensured. Tell the respondent about the level of confidentiality.
- Explain why you take this interview with the respondent. Explain what you are going to ask roughly and why and how he/she is expected to give answers. Ask the respondent permission for audio recording and the time for taking the interview.
- Explain that the interviewer can act different from his own personality to be most objective in asking the question.
- Explain the interviewee the option to adapt his behavior in favor of giving the most complete and right answers to his/her opinion (turning the eyes away from the interviewer).

Determination of the current position on the product-service continuum

Service offerings to the customer

1. What kinds or types of services do you deliver to customers in the pre-sale stadium?
2. What kinds or types of services do you deliver to customers in the post-sale stadium?
3. Why are these services delivered, what is the purpose for the customer?
4. Why are these services delivered, what is the financial purpose for you in terms of cost/benefits eventually per type service?
5. Who receives the type of service (customer segments)?:
 - a. Type industry
 - b. Ratio of orders via contractors/direct end customer
6. When do you deliver services (type relationship)?
7. Where do you deliver services (how are they marketed and who distributes them)?
8. How do you deliver services?:
 - a. How do you price services (per time function/fixed contract/per performance delivered)?

- b. How do you keep control of the service quality (measurements, corrective action, SLA-responsibilities)?

Service offerings from Alpha

1. What kinds or types of services do you receive from case Alpha in the pre-sale stadium?
2. What kinds or types of services do you receive from case Alpha in the post-sale stadium?
3. Why are these services delivered, what is the financial purpose for you in terms of cost/benefits eventually per type service?
4. When do you receive services (type relationship)?
5. Where do you receive services in your organization?
6. How do you receive services?:
 - a. How do you price services (per time function/fixed contract/per performance delivered)?
 - b. How do you keep control of the service quality (measurements, corrective action, SLA-responsibilities)?

Capabilities for delivering services

1. What do you need to deliver these services and do you receive assistance from case Alpha?:
 - a. Company infrastructure (Information management, finance systems, control & planning, and organization structure (structure, process, infrastructure))?
 - b. Human resource management (motivation, skills)?
 - c. Technology development (methods, co-development)?
 - d. Procurement (what and how is the procurement process)?
2. What do you miss in capabilities?

Relationship to the supplier

1. How do you think is the current relationship with case Alpha (the current configuration and working with multiple partners)?
 - a. What are you and case Alpha satisfied about (benefits/advantages)?
 - b. What are you and case Alpha problems about (costs/disadvantages)?
2. How do you manage the relationship with case Alpha?:
 - a. Information management (send/receive, interpretation, processing & dissemination in organization)?
 - a. Cash flow management?
 - b. Capital goods management/sharing (equipment, people, machines, facilities)?
 - c. Product delivery management (spare parts and taking back service)?
3. What do you miss in managing the relationship?

Determination of the future or desired position on the service continuum

Service offerings to the customer

1. What kinds of services would you like to offer in the future (why)? What strategy do you use?
 - a. What services do customers want you to offer in future (why)?
 - b. Ask eventually idem questions from current position

Service offerings from Alpha

1. What kinds of services would you like to receive from case Alpha in the future (why)? What strategy do you use?
 - a. Does case Alpha ask you about services you would like to receive (why)?
 - b. Ask eventually idem questions from current position

Capabilities for delivering services

1. What do you need to deliver these services and do you assist your partner with it?:
 - a. Ask eventually idem questions from current position

Relationship to the supplier

1. What would be the most ideal configuration of relationship to have with Alpha, the current one or different (5 configuration options, why)?
 - a. What will be you and case Alpha satisfied about (benefits/advantages)?
 - b. What will be you and case Alpha problems about (costs/disadvantages)?
2. Did you get feedback from case Alpha about your position, your goals, and where there are deficits (results from questionnaires)?
3. How do you think to manage the relationship with case Alpha when you offer new services?:
 - a. Information management?
 - b. Cash flow management?
 - c. Capital goods management (equipment, people, machines, facilities)?
 - d. Product delivery management (spare parts and taking back service)?

Evaluation

1. Do you have other questions/comments/remarks/ideas
2. Are you open for another interview a later moment in time for giving feedback on improvements made (why or why not)?
3. What did you like about this interview, what not?
4. Would you like to provide additional company information related to the answers you gave in this interview?

Appendix L Format archival company information

Company information from case Alpha and dealers

- Pre-sale stage:
 - Product and company brochure
 - Procedure/plan for activities that need to be done for getting a contract
 - Example contract with the customer for the project and installation activities
 - Minimal requirements of technical information document
 - Document with aspects of technical consultancy you deliver

- Post-sale stage:
 - KPI-performance indicators used in the company
 - SLA-contract or maintenance contract
 - Maintenance concept or service specifications
 - Repairing and maintenance instructions/checklist
 - Results from customer surveys
 - Customer complaints about front-sales/after-sales
 - Customer visit reports

- General:
 - Business model/strategy/company presentation
 - Processes/guidelines/work protocols
 - Organizational structure chart
 - Example of vacancy requirements/education plan/criteria for new employees
 - Customer relationship management strategy
 - Methods for developing services
 - Purchasing process for services
 - Payment contract with the customer

- Alpha documents per relationship:
 - Contract with dealer (VAP/VAR)
 - Payment terms with case Alpha
 - Contract for receiving installation people from case Alpha
 - Document of sending/receiving spare parts
 - Employee training presentation/documents
 - Email conversations
 - Customer visit reports

Appendix M Summary of the results of the cross-case analysis

1.1.1 Output product-services

This section shows the results of how and why cases are similar or different on each other on the type of services they deliver to consumers in the case of Alpha dealers and to dealers in the case of Alpha. Moreover, it will explain the relation to literature. There are eight different characteristics that are unique and essential for each successful service.

1.1.1.1 Front-sale services

1.1.1.1.1 Co-production services

Alpha dealers calculate product requirements based on calculation protocols for ventilation. After the calculation, consultancy advice is given to the customer about what product can be installed based upon the situation, product properties and legislation or certification norms, and customer needs. Detailed product-building-specification drawings are made to illustrate compatibility with the building requirements (case Beta, Gamma, Delta, Epsilon, Zeta, Eta, Theta, Iota). Alpha gives support with product information with standard product drawings, standard building specification-texts, and technical support of product applications and product consultancy. Product installation is done by every Alpha dealer including product transportation. In this respect, Alpha gives support with product installation manuals, product transportation to the dealer or building site. Literature distinguishes these services as well, but neglects product-project engineering and product consultancy. It can be observed that installation service accompanied with the essential services for installing a functional working product is key to every installation company; they are common services. Alpha as B2B-partner is limited to delivering purely product-related services, withholding any project-related services like calculations. In summary, the differences points out that some dealers offer an arm's length offer to advance the front-sales service offering. The nature of the business environment or the size or the capabilities of the company are the main underlying factors for explanation. Furthermore, there seems to be a difference in the type of service delivered by upstream versus downstream product-service company. Finally, Alpha is missing some determinants of pre-sales service support.

It can be concluded that the company size or the level of capabilities is in proportion with delivering an arm's length offer to advance the front-sales service offering. It was noticeable that all larger dealer companies meet this type profile. In addition, it is logically that more advanced company capabilities are needed in case more complex services should be delivered. Secondly, it can be concluded that products cannot be delivered or installed without a minimum level of product-project engineering or consultancy. Literature neglects this aspect and only distinguishes process engineering. However, not in every industry are products pick-and-place ready. Thirdly, it can be concluded that the sharp contrast between the type of service delivered by the manufacturer versus the dealer, can be attributed to the point of formal liabilities or core activities of the manufacturer versus the dealer. In this case company is that product versus project liabilities. In case this border is crossed, the manufacturer does not take advantage of the partnership structure in which projects with its risks are outsourced to dealer companies.

1.1.1.1.2 Co-selling services

Just a few partners use demo products to demonstrate how products are functioning as pre-sales service tool (Epsilon, Zeta). Alpha delivers these product demos as tool for assisting dealers in their front-sale service activities. Literature mentions about product demonstration as well. It seems that some dealers are lacking this sales tool. Epsilon and Zeta are the only Alpha dealers with a long historical relationship. It is possible that demos are not actively marketed by Alpha. Demos and demonstrations are also used by Alpha in their front-sale services to convince potential dealers.

Epsilon gets sales support from Alpha by the country manager. This person looks for projects in the country. But one case respondent mentioned that sales support is not essential in their case: *“The country manager has not more knowledge about the market than my own sales people”*. *“I disagree with the country manager in country x, I don’t think it works, I think it works in country y because each of the partners are much more regional, and they have their own sort of area, whereas in country x we are not regional, we all work everywhere”*. Alpha confirms that one task of the country managers is to build up a network of contacts with market stakeholders and use that network for generating leads to dealers. Literature does not yet mention the option of giving support in selling projects. However, they are still consumed by the customer just like product information as services does at the dealer side. They can therefore be still included in the framework. However, they are not productive services, meaning that they deliver customer value. Therefore, they are treated as different kinds of services.

It can be concluded that co-selling services is a unique opportunity for dealers to increase the amount of projects, but that dealers and Alpha are not communicating well between each other about the presence and benefits of these services. Just a few dealers did know about it, and there was no reason why it would not be beneficial to others. Secondly, it can be concluded that giving support by co-selling services can lead to an encounter between dealers hunting on the same project. Co-selling service support provides a stronger position to dealers, but will inevitably lead to bidding on projects in a larger domain. The third conclusion is therefore that whenever a company forms strategic partnerships with multiple companies, the company should settle down conditions beforehand, in order to minimize theoretically possible competition.

1.1.1.1.3 Co-marketing services

Alpha delivers marketing support in developing the website of dealers, newsletters, and social media (case Gamma, Delta, Theta). Alpha links their website with dealers about their products. Alpha confirms that actually every VAP gets this support. In this way, Alpha assists the dealers in their own marketing operations. This was not yet mentioned in literature.

It can be concluded that a central marketing campaign organized by a large brand manufacturer has much more far reaching consequences than small dealer companies can execute. Hence, it will be convenient if dealers are only delivering product-services under one brand name. Otherwise in-house marketing activities should be deployed.

1.1.1.1.4 Co-productive services

Another peculiarity in front-sale services between Alpha and dealers is that Alpha also divers financial and organizational services to support dealers in their operations. This subsection will elaborate on what kind of productive services are delivered and received by Alpha dealers.

Alpha delivers simulation models as software to dealers, excluding yet CFD (case Delta). Iota got also a calculation program for making project-product calculations for one type product. An addition will therefore be made to the framework.

There is regular management support from Alpha about how things should be organized and processed (case Beta, Gamma, Delta). Alpha delivers also support in setting up a company strategy for growing and reaching geographical coverage. An addition will be made to the framework for assisting in organizational structure.

As was shown in the within-case analysis of Alpha, Alpha offers other type services that do not comply with the theoretical framework. The results showed uniformly over all cases that dealers receive support with productive services and they have no relation at all to front- and after-sales of dealers, which are related to solving customer problems. Likewise, the supply chain for product-services has two types of flows running parallel on each other. Literature does not diverge between productive and consumptive services. Therefore, productive services will be added to the theoretical framework under an apart row.

It can be concluded that services can be divided between productive and consumptive services. Consumptive services in turn can be divided in selling-supportive services, marketing-supportive services, and production-supportive services. Productive services can only be delivered by the business-to-business company, whereas the other services are directly delivered to the end-customer. Nevertheless, marketing and sales services do not generate added value for the end-customer, but are of assistance in order to deliver product-services easily.

1.1.1.2 After-sale services

Alpha dealers deliver S&M on products including spare parts delivery, in different types and conditions. Beta is most advanced with four type contracts specified to the level of customer needs. The dividing over contracts is as follows: the reactive service (contract) with eventual 24/7 emergency support (case Beta, Gamma, Delta, Epsilon, Zeta, Eta, Theta, Iota), preventive maintenance (case Beta, Gamma, Delta, Zeta, Eta, Theta, Iota), empty building maintenance as a simplification of preventive maintenance with only inspection and product functioning tests (Beta, Theta), and preventive maintenance plus (comfort contract) (Beta). Regardless of the type S&M, the professionalism level of S&M is much different over cases, although most of them offer a preventive maintenance contract. Gamma and Delta maintain competitors' products. Other differences are the responsive time for emergency support (4-hour with Delta and Gamma), time interval for S&M, and pricing structure. Alpha delivers maintenance manuals and spare parts. Literature mentions above services as spare parts, reactive maintenance and repair, preventive maintenance, (safety) inspection and performance audits and product service manuals. So in all respects, literature is similar to the empirical research results. Only Epsilon does not offer preventive

maintenance; just in a few cases. *“We don’t really offer service contracts, although if asked we do, but we are not set up as a service company, we are set up as a contract company”*. It is a typical status-quo vision of a product-oriented company. Another reason that Epsilon is not offering S&M is that facility management companies offer complete building maintenance and outsource product Y S&M.

Companies like Delta heavily specialized themselves in S&M, which makes it a lot worse for Epsilon to enter this market. Theta has many customers that do not take preventive maintenance due to cultural bias. Beta is again offering the most advanced services.

In summary, all cases do offer S&M to basically satisfy customers with an operating product as minimal requirement. Beta and Delta are advancing in the after-sales by offering customer-oriented solutions. However, in relation to Delta is Beta sometimes losing services on the continuum. Alpha in general is not giving much support in the after-sales stadium, probably because they have no expertise in offering integrated solutions, equal to pre-sales services. In addition, the primary supply chain in the value chain concept of Porter does include services, however it does not include front-sale services, and it does not include the fact that after-sales service operations are an iteration of selling an offer to the customer. Therefore, a new primary supply chain concept is developed for product-services, which is further illustrated in appendix Q.

It can be concluded that Alpha has lack of knowledge or willingness to deliver support in the after-sales stadium, because their level of support is very low. However, observations within the company have shown that Alpha is willing to exploit the after-sales market, but that a lack of expertise and business model withhold them. Secondly, it can be concluded that companies with a proactive and professional attitude towards delivering customer satisfaction are automatically moving to providing customer-oriented solutions, as a means to generate extra revenues. This will therefore be an important driver in moving along the continuum. Thirdly, it can be concluded that after-sales services are seen as a condition or requirement from the end-customer, than as a valuable option to generate extra revenues. Dealers declare that end-customers are not willing to adopt the product with some form of warranty or basic guarantee that a product could be maintained.

1.1.1.3 Value of services by customers

The customer values dealer services, because they lead to recertification of the product Y and consequently less insurance costs (all cases, except Eta). Customers also value the services, because they release risk and worries about work and life climate with a functional product (case Beta, Gamma, Epsilon, Eta, Theta, Iota). Literature mentions this as well. Recertification of the product Y is also seen as reducing product lifetime worries. Customers value the services as a manner to have one point of contact if anything goes wrong (case Zeta). This is typical for Zeta that has long-term relationships with many of their customers. Literature does not mention it, neither do other cases. Although, it is a kind of value.

It can be concluded that services are valued as a manner of reducing efforts or worries beyond product functioning at the purchasing process or over the product lifetime when situations change. Any service value can be translated back to these elements. Actually, this variable shows the added value of services

beyond products and by differentiating among stages in the continuum can be shown easily what the exact contribution is of each service for the customer.

1.1.1.4 Value of services delivered by dealers

Delivering services is seen as a way to generate circular revenues, higher margins, keeping off competitors in tenders, and creating long-term relationships with customers (case Beta, Gamma, Delta, Zeta, Eta, Theta, Iota). Epsilon does not really offer services, so there is no value to harvest. Literature mentions this as increasing revenues or stable cash flow, but higher margins are not mentioned and are added to the framework. Keeping off competitors is equal to a higher contracting probability, but it was not mentioned explicitly in literature and will be added to the framework. Creating long-term relationships is equal to getting repeat orders, but this is not mentioned in literature and will be added to the framework.

For other dealers are services just a way to deliver customer satisfaction or getting a (repeat) contract with a good company brand name (Gamma, Epsilon, Zeta, Eta, Theta, Iota). This is equal to creating long-term relationships.

It can be concluded that services are a means for generating revenues by fulfilling customer demands or indirectly by receiving feedback for improvement of future customer satisfaction. This conclusion follows logically from the conclusion on the value of services by end-customers. In return of fulfilling customer demands, companies can generate revenues.

1.1.1.5 Value of services received from Alpha by dealers

Dealers value the services from Alpha, because they give assistance in marketing of services to customers (case Beta, Zeta, Eta, Iota). Probably, this is also the case for other case companies, but this was not captured in field research. Literature did not yet capture this finding and the finding will be included in the framework.

Epsilon and Iota feel pleased to get the Alpha services, because they cannot operate without the technical back-up and detailed knowledge and they give them a competitive advantage. They are essential for company viability. Literature did not capture this and therefore, the finding will be included in the framework.

It can be concluded that dealers value the services from Alpha, because they reduce the amount of challenges or more complex problems that usually happen in projects. So Alpha is actually taking a share of benefits that can be generated by the dealer initially. The dealer companies are not designed to produce all types of services, which makes it a valuable option to outsource it to Alpha.

1.1.1.6 Value of services delivered by Alpha

Alpha's first purpose to deliver services is to make revenues, not directly by the services themselves, because most of them are for free, but more by increasing the share of wallet from dealers or provide dealers with more sales opportunities. With more sales opportunities, it is meant that it will be easier for dealers to sell projects when they have front-sales support.

Services are also a means of building trust, brand image, and loyalty to the dealers. Keeping dealers satisfied is seen as a means for strengthening strategic relationships. Some services are a means for getting feedback as input for product-service development. Finally, services are seen as a way to fulfill the dealer needs with a properly functioning product.

It can be concluded that services are valued by Alpha as a means to increase future revenues, by giving assistance to dealers in their front-sales activities in order that dealers will get better sales opportunities. Other services are essential to build up a relationship with dealers to transfer these services well. This paragraph does therefore show that dealers are reliant upon the support from Alpha. They trust Alpha to give high-quality support and therefore they will trust as well upon Alpha, in case Alpha would like to professionalize service operations in future.

1.1.1.7 Customer segmentation

For all cases is the level of services higher for commercial projects versus industrial projects. This is related to the complexity and esthetics of the building. The higher building complexity, the more calculations, consultancy, and technical drawings should be delivered to fulfill customer needs. The higher the esthetics of the buildings, the more customized products are and the more calculations, consultancy, and technical drawings should be delivered to fulfill customer needs.

Another type segmentation is related to the type DMU and equal over all cases. Contractors are looking at minimal functionality while satisfying legislation requirements and price; they are cost-focus driven, while end-customers are looking for the full product performance and are less focused on price. Beyond that, the tendering phase is often paid, meaning that upfront payment is a condition for being in the lead (case Zeta). And moreover, contractors ask for long payment terms (case Zeta, Theta). In addition, end-customers would be relieved as much from their worries, because they lack experience in the business-oriented tasks of investments in equipment and they have often not done any business with an Alpha dealer. Hence, the more service capabilities a dealer will have in house, the more favorable it is for contractors to outsource consultancy work as well to the dealer, since a more customer-oriented solution can be given (Tukker & Tischner, 2006; Penttinen & Palmer, 2007).

From above, it can be concluded that the company able to deliver services to complex projects for end-customers is in the highest stadium of the service transition, while the company who is able to deliver services to simple projects for contractors is in the lowest stadium of the service transition. This is equal to literature that mentions a self-reliant customer in the first stage and a specialized customer with low expertise on non-core activities in the fourth stage. Segmenting between type project and type customer gives new additions to the theoretical framework.

It can be concluded that within the decision-making-unit or type customer, end-customers are asking higher level front-sale services than contractors. Contractors are more reliant upon their own capabilities or resources, whereas the core activities of end-customer have no relation to the building industry.

Secondly, it can be concluded that within the decision-making-unit or type customer, end-customers are asking higher level after-sales services than contractors. Contractors have only the intention to look for

one-off projects. End-customers are in possession of a product or solution for over a lifetime, which makes it much more of interest for them to invest in after-sales services.

Thirdly, it can be concluded that within the type industry, commercial projects are asking for higher level front-sale services than industrial projects. Commercial projects are usually complex, which implies that much more efforts are needed to relieve customer worries or fulfill needs.

Fourthly, it can be concluded that within the type industry, commercial project are asking for higher level after-sales services than industrial projects. Within commercial buildings, it is mostly directly critical if a product is defect, which is not the case for industrial buildings. A high emphasis is therefore placed upon after-sales services.

Fifthly, it can be concluded that the company able to deliver services to complex projects for end-customers is in the highest stadium of the service transition, while the company who is able to deliver services to simple projects for contractors is in the lowest stadium of the service transition.

This is further visualized by a customer segmentation matrix for service level in appendix R.

1.1.1.8 Service marketing and distribution

Services are in general not heavily promoted. Most case companies use the website as promotion and marketing tool, but services are not explicitly mentioned on their websites (all cases). Some companies use newsletters (case Beta, Delta), social media (Beta), and advertisements in magazines (case Gamma, Delta). Alpha gives out newsletters and magazines, and social media to inform dealers about their products and services. Some companies use flyers (case Gamma, Eta). Literature mentions that services should be marketed separately to give them individual marketing attention. But none of the cases explicitly markets services separately, except for S&M. The incidental marketing is done via regular marketing channels.

Customers should assume that dealers take care of calculations and other front-sale activities but they do not, even in the case of Beta: *"We have done market research and apparently none of our customers knows exactly what we could offer, any of them"*. As was seen from the analysis on front-sale services, most dealers only offer services as a necessity to sell any product. So none of them has currently conscious ambition to servitize.

Services are directly marketed and delivered in the front-sales by the project team consisting of the sales manager, project leader, project preparatory, and project installer (Beta, Gamma, Delta, Epsilon, Eta, Iota). In the case of Gamma, many people have contact with the customer and this is currently seen as a difficulty for customers. So actually every partner is delivering services by sales people and project managers, which is similar to literature. Services in the after-sales are marketed and delivered by the service coordinator and service technician (case Beta, Gamma, Delta, Eta, Iota), which is similar to literature.

Alpha directly markets and delivers their services similarly by the country managers and sales support for front- and after-sale services, and production leaders in the after-sales.

It can be concluded that marketing is an activity which is yet heavily undervalued, for both products and services. This is probably caused by the fact that dealers and Alpha are still able to generate a substantial level of revenues. Marketing will not be worthwhile if there is no sharp intention to grow. Besides that, the industry is technological-oriented from origin, meaning that managing directors of

dealers have often no marketing background. So they are actually not known with the value of marketing. However, one respondent has acknowledged that marketing should be done much better, because end-customers are not known with the dealer assortment.

1.1.1.9 Service pricing

Services are free priced in the front-sales till the level of making detailed solutions and calculations, which are not an essence for customers to be informed about or relieving upfront risks or worries (case Beta, Gamma, Epsilon, Zeta, Iota). Custom-made efforts are therefore priced as well. Services are priced per performance delivered by agreement. In the case of Eta, all front-sales services are free priced. Literature is identic here.

In the after-sales, services are priced separately or by service contract. Contracts are beneficial to dealers and hence relatively cheaper (case Beta, Gamma, Delta, Zeta, Eta, Theta, Iota). There are many differences over dealers about what is included in a service contract price. Most of the time, costs of spare parts and repairing labor are excluded from contracts. Literature mentions fixed SLA-contracts, which is similar here. Literature findings in the third and fourth stage are not validated, but cases are not yet in this stadium.

Alpha services to the customer are mostly free priced, but not for example demo units. This is seen as a problem to Epsilon, because it is a manner of taking away product risks for customers: *“We would like to have the samples for free as other companies”*.

It can be concluded that services should be free priced in case they could be seen as a sales tool for reducing customer risks or worries about the product-service or dealer and should be priced in all other cases by performance agreements. In that way, mutually benefits could be obtained by both supplier and customer. Secondly, it can be concluded that supplier ownership of equipment is hardly possible in the case products are connected to real-estate goods. Legislation and inability to de-install products without negative consequences to other products does create more disadvantages than advantages for this determinant.

1.1.1.10 Service quality control

Service quality control consists of prevention and recovery activities, which are further described in the paragraphs below.

1.1.1.10.1 Prevention

Service quality is maintained by most dealers with norms for executing and delivering products or services to customers like the ISO-norm 14001, NEN-norms for products, and VCA**. These norms specify working protocols (case Beta, Gamma, Delta, Epsilon, Zeta, Eta). Theta and Iota only use ISO-norms. Alpha works with these norms as well. Hence, all cases work with qualified people to minimize quality problems. It is typical that Asian companies have not much norms. Maybe legislation is not as strict as in Europe. This is equal to literature that mentions quality norms.

None of the dealers give product performance guarantees or installation performance guarantees like maintaining climate temperature at 25 degrees Celsius. Beta and Gamma give guarantees on front-sale services, like with transportation service to deliver on time and fines are included for failure. However,

Alpha gives product functioning guarantees with warranties on products. Literature mentions performance guarantees as well.

1.1.1.10.2 Recovery

There is a customer satisfaction survey that measures the customer satisfaction on rough KPI indicators (case Beta, Gamma, Delta, Zeta, Eta, Theta). Gamma uses an independent auditor to check the after-sales S&M and a manager S&M. Alpha has no customer satisfaction measurement instruments. Literature defines this as well. There is a complaints handling procedure for handling complaints (case Beta, Gamma, Delta, Epsilon). Alpha has also a complaints handling procedure. Literature does not mention this option and this option will be added to the framework, because four out of eight cases execute this task.

It can be concluded that quality control activities are mostly executed in the name of contractual norms or legislation. Dealers and Alpha have the intention to act on the moment that problems happen on site and customer satisfaction will drop. Only in the case of Delta, quality control is of high priority, because they deliver performance agreements with fines, which is again a formal obligation to act preventively.

1.1.2 Company capabilities

This section shows how and why cases are similar or different in the instruments or capabilities that they possess to produce product-services. Moreover, it will explain the relation to literature. There are seven characteristics mentioned in literature that are unique to product-service instruments.

1.1.2.1 Information

Most companies use an ERP-system for managing their service operations, which is often a structured tree of folders integrated in an interface (case Beta, Gamma, Delta). Alpha also uses an ERP-system with a structured tree of folders in an interface. Information is not shared between ERP-systems of dealers, intercompany dealers as well. In literature, this is described as independent information systems. Other companies have no central ERP-system (case Epsilon, Eta, Theta, Iota). It is questionable whether these companies have information capabilities to servitize, since professional case companies and literature validated it.

Most companies use independent software for executing service operations, like making project drawings or cost calculations (case Beta, Gamma, Epsilon, Theta, Iota), which is a validation of stage one in the literature. Alpha uses also independent software. Zeta can be classified as incapable to servitize, because they cannot share or process information.

There are product catalogs, knowledge about legislation, and competitor market knowledge over all cases. Delta has also knowledge about competitor's products to servitize. It shows that having underlying knowledge is a prerequisite for producing services and this is similar to literature. Alpha offers software program X to customers as an extranet for sharing information about products and news. In that way, Alpha follows literature about synchronizing features on sharing information.

In summary, case companies that are not intercompany use no ERP-system as central information system. Zeta is lacking many information capabilities. Information is shared more with Alpha than with

customers, probably because Alpha has ambition to grow and dealers are incumbents. Furthermore, this knowledge is an important driver of producing services.

It can be concluded that the Alpha supply chain is missing market opportunities, because a lot of information is not available to reap the benefits from (tacit form). Many dealers use no central information system at all, or in case they do, there is a lack of communication practices to share information.

1.1.2.2 Finance

Intercompany dealers use ERP-software for calculating products and services. Delta also uses accounting software. Epsilon, Zeta, and Eta use a spreadsheet for managing the cash flow position. In addition, there is often a financial controller watching over the payments like at Gamma. Alpha manages their finances with an ERP-system focusing on financial KPIs. In addition, country managers have limits on selling services or products to customers. Literature does not describe that the management task of handling invoices will take more effort when services are provided. Because all dealers are active in this process, an addition will be made to the framework.

Dealers have different type service contracts and payment terms and conditions in order to increase product-service adoption by customers. As a result, the customer financial situation will be better aligned to the service supplier. Alpha has also a wide range of payment terms and conditions. Literature describes this as financial incentives for product-service adoption.

It can be concluded that dealers and Alpha are very focused on financing their current operations, while simultaneously a more forward should be made by forecasting future capital demands. However, it is particularly obvious that this never happened, because that is the reason for performing this research.

1.1.2.3 Control and planning

Planning and controlling is done by project planners or contract managers (case Beta, Gamma, Delta, Epsilon, Zeta, Eta, Theta, Iota). Forecasts are made about activities with the project contract as input. Planners control also daily service operations. At Gamma use planners the ERP-system. Alpha makes detailed planning schedules for production with its ERP-system and planning software. So formal contracts are used with customers and suppliers, which is similar to the framework. The fact that Gamma uses the ERP-system, with project management techniques included, and delivers sometimes integrated solution, validates this capability in the third stage of the continuum.

Planners receive information from diverse sources (case Beta, Gamma, and other cases to a lesser extent). Alpha registers all information about upcoming projects. In the after-sales are customer complaints registered as well to follow-up on complaints easily with a short-term planning schedule. Replenishment systems as described in literature are almost similar in the function of receiving information about input and output resources.

There is a detailed planning forecast or schedule for S&M (Beta, Gamma, Delta). Other cases did not mention this, but they are also active in S&M. No clear explanation for this difference can be found yet. The detailed planning forecast is made with the input for long-term contracts with customers, which is

similar to a kind of trading protocols in literature. Alpha has also trading protocols with partnership contracts.

From the results, it can be concluded that planning and control is still a very complex and inefficient process for regular product-related projects, and expected to be much more difficult when being involved in delivering extensive services. A product-service company has to deal with a large assortment of items that should be delivered to the customer, where project management software will be indispensable. Currently, project meetings and planning by hand are still dominating in dealer companies.

1.1.2.4 Organizational (infra)structure and process

Dealers split up projects and S&M in two divisions (case Beta, Gamma). Delta talks about three divisions splitting up projects in sales and project operations. Epsilon does not split up projects and S&M in divisions, because there is no S&M. Zeta, Eta, Theta and Iota do not split up in two divisions as well. Alpha does not split up service activities from product operations. A split up between production and service operations in accounting terms could give better financial insight and could be a logical step. The first stage of the theoretical framework talks as well about setting up service operations as an apart business unit. Front-sale services are often not split up as apart business unit, but literature mainly focuses on after-sales S&M.

There is a standard general procedure for processing product-service inquiries. Via the sales department and project leader is work divided over different domains. There are as a result two operating layers. Direction is only involved with critical projects or problems (case Beta, Gamma, Delta, Iota). Epsilon has no hierarchy at all, neither have Zeta, Eta, and Theta. This can be attributed to the small size of the companies. Alpha has a flat organizational structure with a management team and departments. This structure is in literature described as a flat horizontal structure.

Individual work processes are written down. There are work instructions from executing tasks to save documents and how to treat with purchasing (case Beta, Gamma, Delta, Epsilon, Iota). Epsilon in particular has very detailed work instructions and guidelines for how to work. Zeta and Eta have no work protocols. Theta has some work protocols. Alpha has some work protocols as well, but not as advanced as intercompany dealers do. A more fanciful name is service blueprints in literature.

Beta, Gamma, and Delta have geographical rayon's from where sales people operate. Iota has no geographical regions from where people operate, but that is probably because the country is very small. Alpha works also with geographical regions in the form of country managers that work on remote basis in every country where dealers are located. The ethnocentric infrastructure is similar to this infrastructure. In the S&M work service technicians from satellite offices. They plan their own operations, but are still managed by headquarters (case Beta, Delta). All other cases do not have satellite offices. In Gamma, S&M is launched very recently, and having satellite offices would probably their next logical step. At Alpha, a few country managers work from their own home office, which can be seen as some kind of satellite office. All other cases in the form of Epsilon, Zeta, Eta and Theta work on a very local basis.

It can be concluded that an organizational structure is indispensable when working with large projects, involving many people, resources, and a large set of product-service offerings on distant locations. These factors contribute to a loss of oversight and inability to be managed by one person. Therefore, having an organizational structure, accompanied with additional work protocols or blueprints will be essential to deliver complex service offerings.

1.1.2.5 Human resource management

People are motivated to deliver customer satisfaction. In turn people get a sales kick and being satisfied that their work turned about to be helpful or a success (case Beta, Eta, Iota). This is also an important motivation driver at Alpha. In other words, it is an intrinsic motivation to succeed at the customer as is mentioned in literature. People get good salaries and secondary work benefits as compensation to their contribution (case Epsilon, Zeta, Eta, Theta, Iota). Delta has in particular a high focus on stimulating and motivating people individually. People in the S&M get extra compensation with a long vacation schedule and Delta is flexible for them for having a good work-life balance. Delta in particular has very demanding S&M tasks over other cases.

People need to have technical skills, construction knowledge (case Beta, Gamma, Delta, Epsilon, Eta, Iota), electrical knowledge (case Gamma, Delta, Epsilon, Zeta, Eta, Iota), organizational competences (case Beta, Eta, Theta), specific job-related skills or knowledge for solving problems (Beta, Delta), knowledge of the languages (case Beta, Gamma), sales and relationship management skills (case Beta, Iota), communication skills (case Beta, Iota), being flexible and responsive (case Beta), financial knowledge (case Beta, Eta), and working certificates for working with mobile platforms and working lines (Beta, Delta). People need technical skills, construction knowledge, basic knowledge about electronics, organizing competences, specific job-related skills or knowledge, knowledge of the languages and cultures, sales and relationship management skills, communication skills at Alpha. They also need problem solving skills, persistence and perseverance, teaching skills, and skills about how to work with processes and protocols.

In summary, at most companies, people have an intrinsic motivation to succeed. A product-service company leads to more challenges for the workforce, but most companies are aware of this fact and give people the ability to be trained and stimulate people in diverse ways. At the supplier side of Alpha, giving response to customers is less intensive and less assistance is required by the employer.

It can be concluded that delivering product-services creates more challenges to the workforce, but the intrinsic motivation will hold if being told to the workforce to what extent servitization is beneficial and a necessity to execute. On the other hand, service-oriented companies ask more efforts from employees, so that compensation packages should be modified as well. As such, employees will be set apart from the challenges and risks of servitization.

1.1.2.6 Service development

New services are developed by looking at the supply side of the market what is available and what is asked at the demand side. This is done by talking to many people in the company network (case Beta, Eta). After that, the product or service is developed and tested in the company or externally for certification at Beta. Gamma uses meetings to brainstorm and assess ideas, while Delta assesses ideas at

the board of directors. However, incoming ideas from employees are appreciated. There is no fixed procedure for how to develop services at Beta. Gamma makes a guideline and action plan for development and makes a feasibility study with market research. Delta has also a guideline and action plan for development.

Literature mentions that rigid and structured traditional new product development methods are dominant in the first stage of the continuum. This is indeed the case at Beta and Gamma to some extent as the development of services and products is intertwined. Beta and Eta also use the input from front- and back-end operations as input for development. Alpha does this only for the back-end operations. Actually, none case company has a formal guideline for service development. Gamma comes most close here. Eta has an ad-hoc development of services which represents the third stage on the continuum. This is contrasting with the position of Eta on other characteristics. But in the past, Eta had no formal guideline and there is no fundamental background below ad-hoc service development. So this cannot be validated.

It can be concluded that dealers expect service development to be a task of the product manufacturer, whereas the manufacturer also expects dealers to innovate in services as well. This ambiguousness thought create an impasse in professional service development throughout the supply chain. Some dealers like Beta and Gamma seem to develop services on their own, because otherwise minimum customer satisfaction levels cannot be realized.

1.1.2.7 Service procurement

Procurement will be analyzed on two aspects: what kind of services is purchased and how the purchasing process of services is different than from products.

Zeta, Theta, and Iota purchase engineering expertise or CFD-calculations (case Eta, Delta, Theta). This is seen as a standard service, because it is a crucial service to deliver products, which resembles with literature. Epsilon buys financial services from managerial consultants. This service is standard accounting practice. Gamma, Theta, and Iota buy credit limit reports. Buying credit limit reports seems to belong to the professional companies. Theta falls apart, because of the precarious country situation. Eta buys regular safety audits. Gamma also uses an independent auditor for checking the after-sales service quality. Beta purchases product testing and certification. Beta and Eta purchase knowledge. Product cleaning and installation are sometimes subcontracted (case Beta, Theta). Subcontracting labor is related to the culture and therefore a special situation for Theta. The results show that Gamma, Eta, and Beta purchase the most services, followed by Iota. This is in comparison with literature, which mentions that more expertise is hired in the second stage of the continuum, which is the position of the professional cases Gamma, Beta and Iota.

All dealers purchase services from Alpha, whether or not consumptive or productive services and all cases purchase software. Gamma in particular purchases service at Alpha for warehousing products. Alpha purchases knowledge, translation expertise, credit limit reports, and product testing and certification. In general, buying services is something new to Alpha.

The purchasing process of services is different over products, because services are bought by relationship over a longer time period with vast pay intervals (case Beta, Eta, Alpha). Heavy negotiation about price will lead to lower service quality. This leads to companies being deliberate on price

negotiation with buying services. It is about buying services by relationship, so this option will be added to the second stage of the framework. Quality assessment of services is done by looking at the performance of services, while with buying products they look at product specifications (case Beta, Gamma, Epsilon, Iota, Alpha). However, performance of services is less measurable. This means that assessment of performance is done based upon the knowledge about the service content (case Beta, Epsilon, Iota, Alpha). Literature does not highlight these options, so extensions will be made.

It can be concluded that the flow of the type and volume of services purchased over time is a more dynamic process than for products. With products, only a fixed amount of components are purchased, whereas with fulfilling customer demands with services, sometimes different types of expertise should be hired. Secondly, it can be concluded that the purchasing function of services is much more complex and intensive, than for purchasing product components. It is hard to assess to be delivered service quality upfront, which implies that many other tools are needed to assess service quality in some way.

1.1.3 Supply chain interface

This section shows how and why cases are similar or different in the supply chain interface with Alpha. Moreover, it will explain the relation to literature. The supply chain configuration and the four relationship channels or categories will be analyzed.

1.1.3.1 Supply chain configuration

In the cross-case analyses on supply chain configuration, it was not possible to ask all questions for over all case companies. Alpha assumed that asking questions about organic growth and downstream integration were too intriguing to ask to dealers. It could have led to distrustful behavior, so permission for asking these questions was rejected.

The cases highlighted supply chain configuration. Literature did not mention yet the order of supply chain configuration to use in the servitization transition. Based upon above empirical research, it can be concluded that the system integration configuration is strongly connected to the third stage of the continuum in order to offer a complete customer solution. On the upstream side of the supply chain, it was found that companies should be integrated, but only in case of special capabilities that are hired very often or are of incredible importance to secure future business growth. Other upstream businesses with a range of applicable and non-applicable capabilities or non-distinctiveness should be left on their own in order to maintain flexibility to react on the dynamic business environment of product-service offerings. Empirical research found that upstream integration is more desired when moving to higher servitization levels. Hence, it is expected that the intensity of upstream integration will rise when moving to later servitization stages. On the downstream side, three different options are possible: integration, outsourcing, and organic growth. Organic growth is found to be the less good option in relation to integration. There is a lack of knowledge about the end-market, and more investments should be made to start up foreign sales offices. Downstream integration has drawbacks in terms of financial risks. However, the higher margins that can be earned with downstream services and the ability to get grip on the end-customer are very beneficial when implementing a servitization concept. Outsourcing however diminishes financial risks, but the advantages of product-services are not captured as well. Therefore, partial outsourcing or any form of partnership is found to be the best option to use. These partnerships

should be set up from scratch by selecting partners that are willing to servitize. Over time, this partnership should be intensified with more benefits for downstream partners as well as more conditions to share information and capabilities like a long-term cooperation agreement, as was mentioned. Lastly, it should be noted that the supply chain configuration of partial outsourcing is linked with provision of productive services by the upstream manufacturer. When Alpha and dealers would not work in cooperation, providing productive services would be worthless for Alpha.

Based upon above empirical research, it can be concluded that the system integration configuration is strongly connected to the third stage of the continuum in order to offer a complete customer solution. On the upstream side of the supply chain, it can be concluded that companies should be integrated, but only in case of special capabilities that are hired very often or are of incredible importance to secure future business growth. Other upstream businesses with a range of applicable and non-applicable capabilities or non-distinctiveness should be left on their own in order to maintain flexibility to react on the dynamic business environment of product-service offerings. Even more, upstream integration is more desired when moving to higher servitization levels. Hence, it is expected that the intensity of upstream integration will rise when moving to later servitization stages. On the downstream side, three different options are possible: integration, outsourcing, and organic growth. Organic growth is found to be the less good option in relation to integration. There is a lack of knowledge about the end-market, and more investments should be made to start up foreign sales offices. Downstream integration has drawbacks in terms of financial risks. However, the higher margins that can be earned with downstream services and the ability to get grip on the end-customer are very beneficial when implementing a servitization concept. Outsourcing however diminishes financial risks, but the advantages of product-services are not captured as well. Therefore, it can be concluded that partial outsourcing or any form of partnership found to be the best option to use. These partnerships should be set up from scratch by selecting partners that are willing to servitize. Over time, this partnership be intensified with more benefits for downstream partners as well as more conditions to share information and capabilities, like a long-term cooperation agreement, as was mentioned in literature.

1.1.3.2 Information relationship channel

Information is send by email, phone, or by person (all cases). The information send by internet follows the extranet (case Beta, Gamma, Delta, Epsilon, Eta). Zeta uses no extranet of Alpha, only information by paper. They receive information by postal. Theta and Iota use no extranet of Alpha, because Theta is no VAP and Iota is just recently becoming a VAP.

There are formal agreements in SLAs and they should be followed up by people, but that is currently not done (case Beta). Alpha conforms that there are SLAs or fixed conditions on liabilities for using the calculation tool and extranet, but also mentions that the best communication is send if there is mutual willingness to receive and use it. An addition is made to literature about formal commitment, because literature does not mention about this.

It is troublesome for dealers to know whether something has changed on the extranet (case Beta, Gamma). Actually, most dealers do not use the extranet. They rely on the contact persons (case Delta, Epsilon, Eta, Alpha). Some dealers do also complain that Alpha has no uniform locations where to find information. They propose to have one location per item (case Beta, Alpha). Some dealers have not the

right person to be in contact with Alpha. The person is not in the job function to use or disseminate information about Alpha well within the company (case Alpha). Having the right contact person is therefore a pre. Agreements are made where to save information and manage that with Navision (case Beta). Eta has shared networks within the company. Theta disseminates all the information by putting it on a central server. So most companies have a central information system where information is stored.

It can be concluded that intercompanies and thereafter VAPs have more options to manage the flow of information than VARs. The type supply chain configuration affects the flow of information. Being owner of a dealer implies that there is no risk that intellectual property will be shared with competitors, which makes it no problem to share information over both the intranet and extranet. Contrastingly, an intercompany structure has also disadvantages in managing the flow of information, because less priority should be given to satisfying people working in a company that is owned by the manufacturer. Secondly, it can be concluded that a user-friendly virtual working platform would be the central driver for managing the information flow. Many other determinants like the use of standard formats, minimization of administration and proactive responsiveness can easily be accomplished under the name of such a platform.

1.1.3.3 Cash relationship channel

Payment is done over the internet. Invoices are automatically send after the product is put on transport at Alpha. Services and products and cash are taken care of as one package. There is a monthly meeting with Alpha to manage the finances. Monthly financial data are shared with Alpha (case Beta, Gamma). There are payment terms with Alpha for 60 days (case Epsilon, Zeta). Theta and Iota have a payment term of 30 days. For Eta, the payment term is longer, because they are otherwise running out of cash, while they are making the move towards servitization but lack the financial capabilities yet. Alpha confirms that there are clear and concise agreements about paying invoices in payment terms. Other agreements are made on the time to inform the customer in advance about changes in product prices.

It can be concluded that servitization has large impact on stabilizing the cash flow balance between a manufacturer and dealer. This is caused by the fact that the payment model of services is different, it is much harder to forecast to what extent end-customer will pay dealers, and how financial risks should be leveraged to the manufacturer versus dealer. In order to stabilize the cash flow balances of the supply chain, other tools should be applied.

1.1.3.4 Capital goods relationship channel

People and capital goods are not send to Alpha dealers very often. Sending supervisors and equipment usually only takes place when a company is a new Alpha dealer or when new type products are bought for which installation assistance is desired. The conditions for sharing people and equipment are information about the problem specification, and the problem location. From that point, a plan is developed about what should be delivered, what equipment and tools should be packed, how safety should be arranged, agreements on responsibilities of Alpha and the dealer, what people are needed, product knowledge, arranging the logistic function, and making a planning. Literature also mentions that capital goods should be made transportable to be shared with the customer, which Alpha calls packing

tools. An SLA-contract is used between Alpha and the dealer (case Beta, Alpha). Literature confirms such a contract.

It can be concluded that the capital goods communication channel is solely used whenever the information channel cannot be used as alternative, thus in case some form of physical assistance is needed. Although people can operate within the channels of information and capital goods, it does take less effort to communicate by the information channel.

1.1.3.5 Products and spare parts relationship channel

The logistic infrastructure for spare parts is almost equal to products. Small spare parts are delivered by parcel express to speed up the logistic process (case Beta, Zeta, Eta, Iota, Alpha). But field research has shown that Alpha is slow on sending spare parts (case Beta, Gamma). Theta mentions that the transportation service from place Y to Malaysia is too expensive and too long. Products should come directly from place X. Alpha mentions that the priority on taking care of spare parts delivery is undermined by the priority on product delivery. The results show that the logistic function should be adapted in case of the Asian companies. In comparison to literature, the logistic infrastructure is adapted to fast delivery of spare parts when talking about the parcel express option.

It can be concluded that the spare parts delivery process is much different from sending regular products. Spare parts have other dimensions, transportation conditions, and purpose for the manufacturer versus dealer. Hence, the transportation distribution function is different to meet these requirements.

Appendix N Composition and fulfillment of customer needs

Variable of investigation/case company	Case Alpha	Case Beta	Case Gamma	Case Delta	Case Epsilon	Case Zeta	Case Eta	Case Theta	Case Iota
	product information, product drawings, buildings spec, texts, product manuals, test certificates, electrical drawings, technical product support, customized product engineering, transportation service, temporal warehousing, software for making quotations, product training, product installation guidance, organizational support, co-marketing support, co-selling support	customized calculations or simulations, semi-customized offerings, consultancy advice on product selection, financial calculations, customized product design, detailed product-building drawings, project coordination, installation	customized calculations, one source contracting, planning, coordinating and organizing projects, simulations, delivery of project drawings, project and product consultancy, financial calculations, installation, designing customized products on ad-hoc basis	technical drawings, technical consultancy, financial calculations, detailed project drawings, simulations, coordination of projects	technical drawings, customized calculations, technical consultancy, installation	making detailed product drawings by hand, technical consultancy, calculations, installation	technical consultancy, calculations, making detailed project drawings, installation	technical consultancy, detailed project drawings, technical support with calculations, installation	technical consultancy, detailed project drawings, customized calculations, installation, project coordination
Front-sale services	complaints handling, product maintenance manuals, product upgrades, product warranty	installation evaluation meetings, S&M on products, customer satisfaction evaluations, 24/7 hotline, customer training, regular customer contacting	S&M done on products, regular customer contact, 24/7 hotline, customer training	very professional in S&M, delivering engineering work sheets, refurbishment and upgrades, 24/7 hotline	no real S&M, 24/7 hotline, reactive services are delivered, recertification service	S&M, regular customer contacting, 24/7 hotline	S&M, 24/7 hotline	product operation manual, S&M, 24/7 hotline	S&M, 24/7 hotline
After-sale services	Not applicable	Being relieved from worries about product dysfunctioning	get relieved from product adoption worries, feeling special treated	means to keep their system certified, having a proper functioning product	a means to win a project (contractors), having a proper functioning product, keep the product certified	keep the product certified	keep the product certified and working over a lifetime	keep the product certified, having a proper functioning product, overcoming the status-quo bias or others	keep the product certified, a means to win a project (contractors), getting authority approval
Value of services by customers	help organizational growth, help in selling solutions, help to strengthen the relationship with case Alpha, help with customer retention	earning circular revenues, creating long-term relationships, being attractive to customers	generating higher value on offering to create higher revenues, relationship management tool	help the customer when they have a problem	convince customers to buy the product, create customer satisfaction, win a contract, get feedback	a means to keep in contact with the customer, get orders, increase efficiencies in working	a means to get an order, generating circular revenues	generating revenues, marketing tool for repeat orders, relationship management	generating revenues, increase brand image
Value of services by dealers	make higher revenues, increase selling opportunities of dealers, building trust, brand image, loyalty, probe for feedback about offering, offer the right product to the dealer	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Value of services by case Alpha	the level of services is higher for small companies, commercial buildings, counties with extensive legislation or cultural values, VAPs, dealers with high service level, end-customer	90% commercial, 90% contractor	30% commercial, 80% contractor	90% commercial, 100% PM-contractor	50% commercial, 90% contractor	0% commercial, 0% contractor	90% commercial, 90% contractor	25% commercial, 90% contractor	60% commercial, 100% contractor
Type customer segmentation	traditional marketing instruments, delivery by country managers, sales support, annual meeting, partner meeting day,	traditional marketing instruments, marketing products and services as one solution, delivery by sales people, project team, and service technicians	some traditional marketing activities, delivery by sales people, service technicians	after-sales services are used as marketing tool, some traditional marketing activities, delivery by field service engineers	some forms of traditional marketing activities, delivery by sales people and project managers	only marketing by sales people	some forms of traditional marketing	some traditional marketing, acquisition of projects	some traditional marketing, networking, delivery by sales people, contract managers, service technicians
Service marketing & distribution	generally free priced, but afterwards included in product price	services are free in front-sales, except detailed calculations, after-sales services are priced with four type maintenance contracts	front-sales services are free, after-sales services are priced in service contracts	front-sale services are free (price paid), after-sales pricing based on volumes of work	services are free in front-sales except when third parties should be consulted, after-sales services are priced	front-sale services are usually for free, after-sales services are priced in fixed contracts	front-sale services are free, after-sales services are priced in contracts	front-sale services are free or paid in payment terms, services are priced in two type contracts	services are free in front-sales except when third parties should be consulted, after-sales services are priced in two type contracts
Service pricing	KAM manual, work process certificates, formal feedback, complaints handling procedure	customer satisfaction survey, working norms, professional complaints handling	high quality employees, working norms, work checklists, structural complaints handling method	using work norms, checklists, independent site audits, many KPIs, general complaints handling	using work norms, internal quality check before delivery, customer feedback	incoming product-service checks, work norms, customer reviews, checklists	work checklists, work norms, customer feedback	incoming product-service checks, visually inspection after installation, work norms, customer	using common sense, work norms, qualified personnel, after-installation inspection
Service quality control	central ERP-system, standard structure tree for projects, extract for sharing information with stakeholders, intranet, diverse software and knowledge	central ERP-system, standard structure tree for projects, advanced software and knowledge	ERP-system for managing projects, bibliotekas with knowledge, review meetings	central ERP-system making use of all company processes, lot of knowledge about a wide range of products	structure tree for organizing document in folders, software and product knowledge	tacit knowledge in people's brains, knowledge is kept in paper folders	technical knowledge, and software programs for product design	technical knowledge, and software programs for product design	technical knowledge, and software programs for product design
Information	Management of finances in ERP-system on KPIs, licenses for signing orders, payment terms, monthly review of accounts	Management of finances in ERP-system, payment terms and conditions	management of finances in ERP-system, payment terms and conditions	management of finances in ERP-system, payment terms and conditions, flexibility with some customers	management of finances in spreadsheets	management of finances by administrator and accountant	management of finances in software, weekly account meetings	financial insurance, bank guarantees, monthly account review meetings	financial insurance, payment in partitions by customers
Finance	Planning in ERP-system, registration of activities, planning meetings	project planners plan projects, based on demand and capacity available	ERP-system used for planning, planners make detailed plans, track and trace systems for planning partially after-sales activities	less planning and control due to having a few large customers, plans are made in advance	project manager plan and controls a complete project, project planning are forecasted	simple product planning	planning by contracts managers, and project manager, weekly meetings	every project is planned and tracked, buffer time reserved in projects, use of critical path method	forecast planning, regular meetings in after-sales
Control & planning	flat structure, work protocols, two operating locations	two divisions, projects and S&M, work processes and protocols in ISO-norms, rayon coordinators and satellite offices	three divisions, sales, operations, and after-sales, frequent meetings are held, service technicians are divided by regio, but work from main office	three divisions, sales, operations, and after-sales, standard processes for handling projects, large infrastructure with many satellite offices	working in team structure, structured work protocols	flat organizational structure, maintenance protocols	people work in a team	two divisions, sales and operations, logistic procedure for shipping and installing products	working in departments, sub departments in terms of regions, work standards
Organizational (infrastructure & process)	people have autonomy, work variation, challenges, attention, work as a team, speak different languages, technical and business knowledge, communication and relationship skills	people get challenges, space to deploy, getting the sales kick, cooperating in a team, people need technical skills, and organizing competences	assessment tests at solicitations, education planning, people are committed to solve customer problems, people need technical skills and there are specific trainings	people are motivated with vacation schemes, being flexible with them, people need a wide range of technical skills, able to work in different situations	people feel part of the business, people need technical skills, able to work with different kinds of software	people like the work, there is a team feeling, people need technical skills and get training	people like the work, getting the kick to be successful, healthy work-life balance, people need technical skills	people are extra compensated when doing better, people need technical and knowledge in organizing and planning	people are motivated by fulfilling their career demands, sense of being successful, people need technical skills and able to work with software, negotiation and presentation skills
Human resource management	idea collecting box, small feasibility study with go/no go decision	services are developed by looking at the market, networking, services are sometimes co-developed	ideas are discussed in meetings, a guideline and action plan is developed for creating a new service	services are developed by board of directors, ideas are discussed with employees	reliance on case Alpha for service development	none, only when there is time left	learning while doing, co-development sometimes	reliance on case Alpha for service development	learning while doing for service development
Service development	purchasing of translations, credit insurance checks, specific knowledge, software, product testing	purchasing of product tests, product cleaning, sometimes installation	software and simulations are bought, other services are bought from case Alpha	some services are subcontracted, other services are bought from case Alpha	software is bought, other services are bought from case Alpha	software is bought	buying of IT-services, regular safety audits, and simulations	temporarily hiring of installation people, and simulations	calculations or simulations are bought
Service procurement	partnership contracts distinguishing VAPs and VARs, no organic growth, vertical integration, or complementary products	intercompany	intercompany	intercompany	VAP, problems with multiple dealers in one country	VAP	VAP, problems with multiple dealers in one country	VAR	VAR
Supply chain configuration	no fixed format of communication, reactive service delivery, country managers receive and process information	short communication lines if possible, management meetings, loss of personal contact, and bureaucracy at case Alpha	people know the task of themselves and others, handling complaints by case Alpha is slow, get updates, give priority to problems	people know the task of themselves and others, people communicate frequently in dialog	personal alignment with country manager of case Alpha, standard protocols for preventing misinterpretation	very frequent contact with country manager	contacting over phone, telephone and email with the country managers and sales support	fast responsiveness of information, getting updates on changes, contact with country manager	fast responsiveness of information, sometimes is information wrong interpreted, one contact person
Information relationship management	automatic payment or orders, credit limits and payment terms shape conditions for payment	sharing of financial situation with case Alpha, invoices are registered in ERP-system	sharing of financial situation with case Alpha, invoices are registered in ERP-system	sharing of financial situation with case Alpha in bimonthly meetings	standard payment terms	standard payment terms	standard payment terms, get payment notification	standard payment terms, payment in advance occasionally	standard payment terms, discount on big projects, discount on buying in advance
Cash relationship management	occasionally sending of people and equipment on temporary basis	Case Beta sends people in name of case Alpha to dealers	very rarely are people send over when there are problems on site	people are send over when there are problems on site	very rarely are people send over	very rarely are people send over	people are send over when there are problems on site	none	none
Capital goods relationship management	low responsiveness on sending spare parts, transport from one location by parcel express	the flow of spare parts is difficult when there is a problem in the chain	sending and receiving spare parts is difficult, interpretation errors	both case Alpha and case Delta check product quality of spare parts, case Delta administers transportation of products	problems with receiving on time transportation information	transportation of spare parts by express delivery	transportation of spare parts by express delivery	logistic service is found to be expensive and long	small spare parts are transported by express delivery
Product & spare parts relationship management									

Table 5 Summary within-case analysis

Appendix O Process flow type services

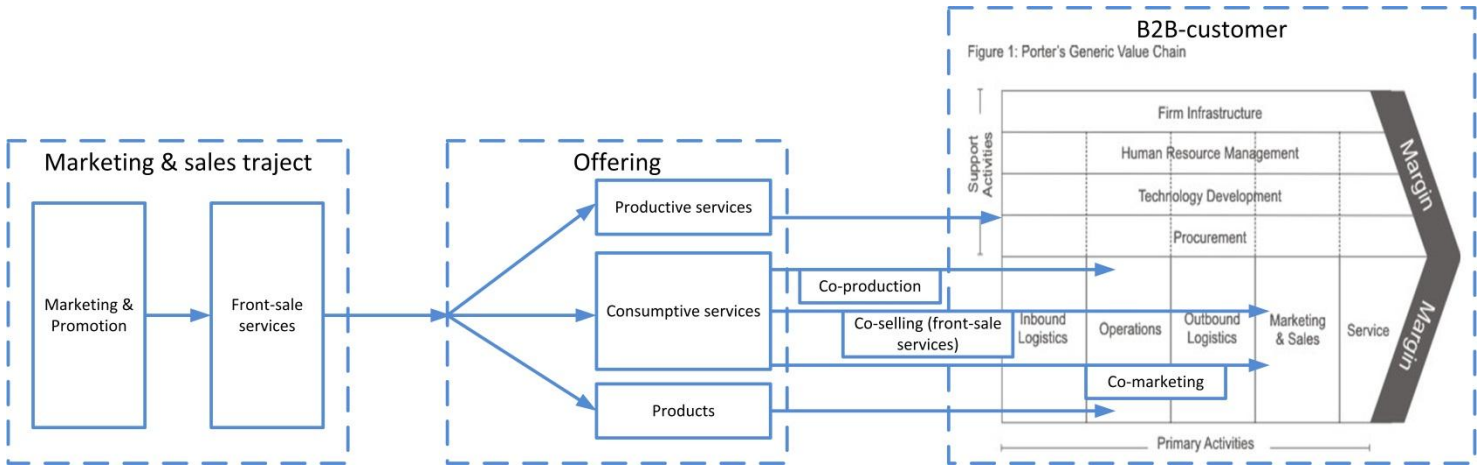


Figure 11 Process flow type services

Appendix P Definitions and characteristics of type services

Service category	Productive services	Consumptive services	Consumptive services	Consumptive services
Type services	Productive services	Co-producing services (customer solution)	Co-marketing services	Co-selling services (front-sales services)
Definition	Services that aid in the production of consumptive services	Services to solve a customer need	Services to create an interaction with an offering	Services that guide adoption of an offering
Characteristics	Used, but not consumed	Consumed	Consumed	Consumed
	Operating in the back-end	Operating on the front-end	Operating on the front-end	Operating on the front-end
	Solving company needs	Solving customer need	Focused on awareness	Focused on trial
	No sharing of risk and responsibilities	Sharing of risk and responsibilities with upstream manufacturer	Simple or basic customer worries/risks	Complex or advanced customer worries/risks
			Product specifications as input	Customer requirements as input
			More one-way	More two-way, including feedback
			Short-term customer attention	Long-term customer attention
		Push-oriented	Pull-oriented	

Table 6 Definitions and characteristics of type services

Appendix Q Primary supply chain product-services



Front-sales operations			After-sales operations	
Marketing	Front-sale services for adoption	Production and delivery of product-service offering	Front-sale services for adoption	Production and delivery of product-service offering

Figure 12 Primary supply chain product-services

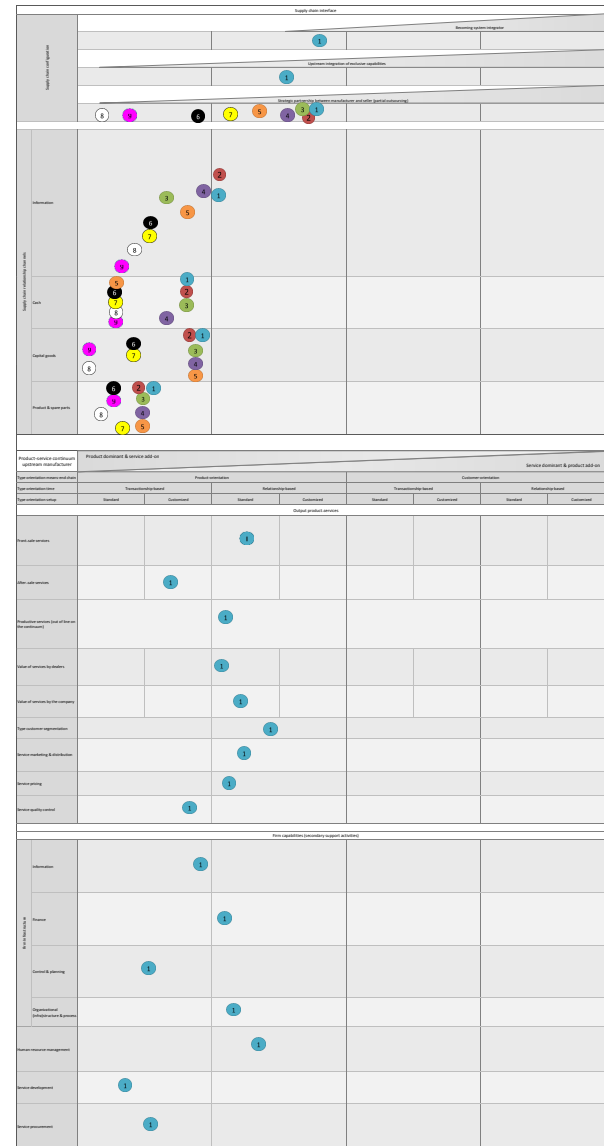
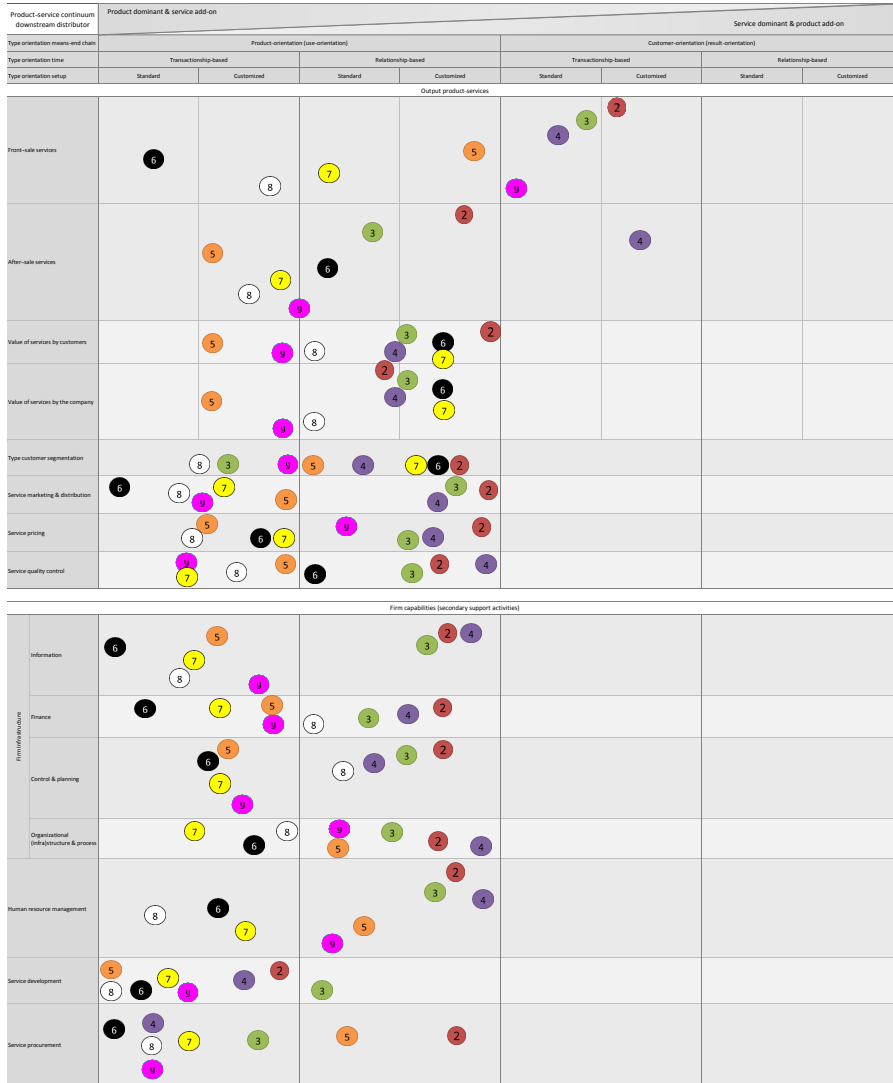
Appendix R Customer segmentation matrix for service level

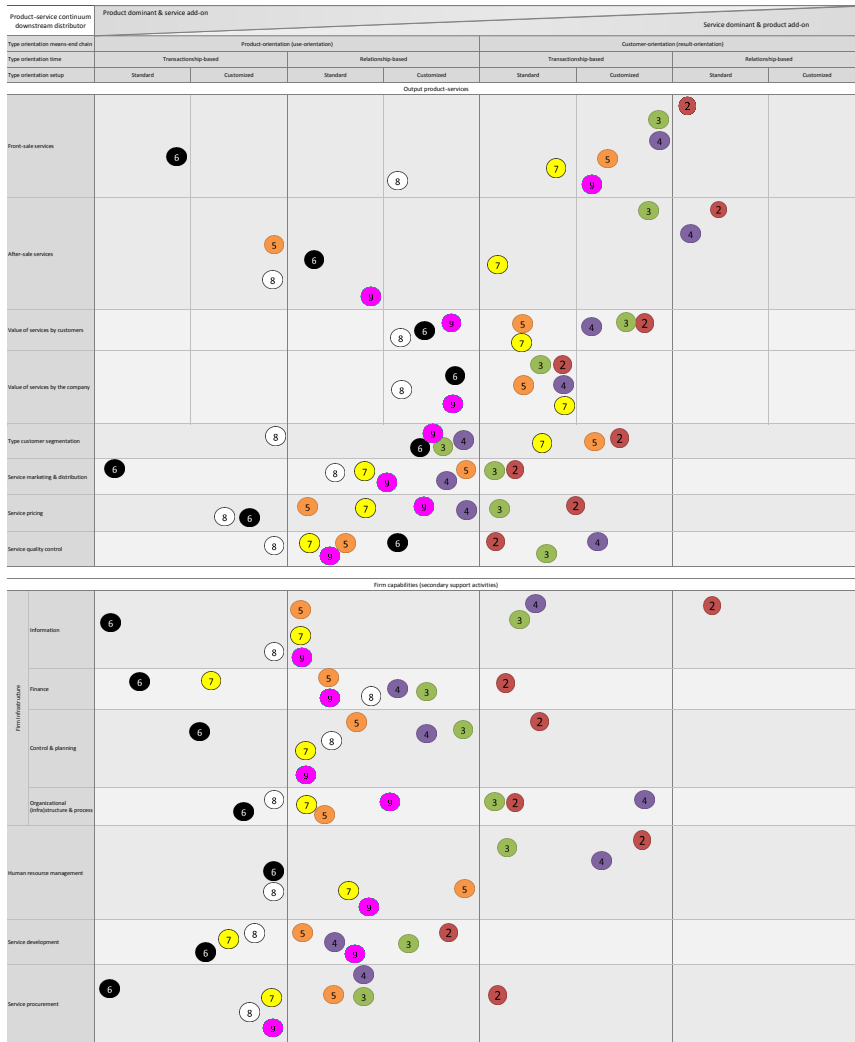
Customer segmentation matrix for service level		Type DMU	
		End-customer	Contractor
Type demand complexity	Complex (commercial)	High (F&B)	Medium (B)
	Simple (industrial)	Medium (F)	Low

Figure 13 Customer segmentation matrix for service level

Appendix S

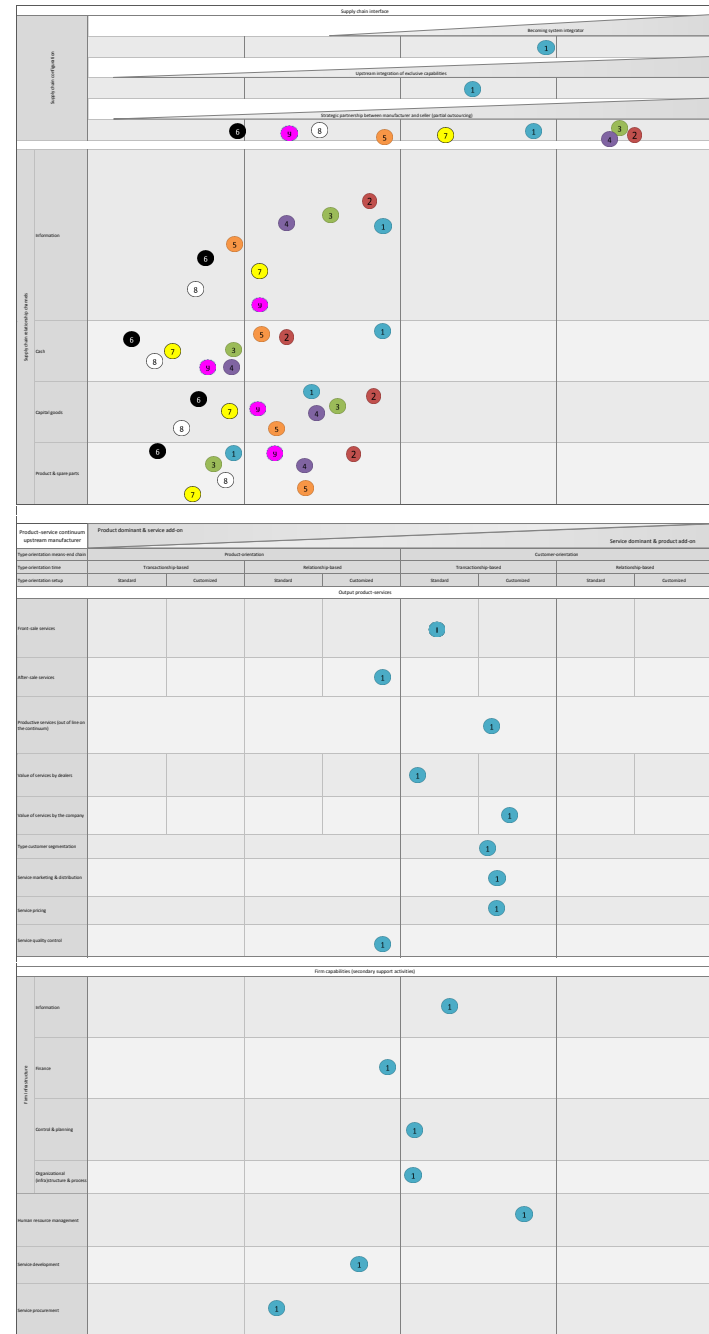
Current and future position of cases on the servitization continuum





Legend	Case company	Alpha	Beta	Gamma	Delta	Epsilon	Zeta	Eta	Theta	Iota
	Number	1	2	3	4	5	6	7	8	9

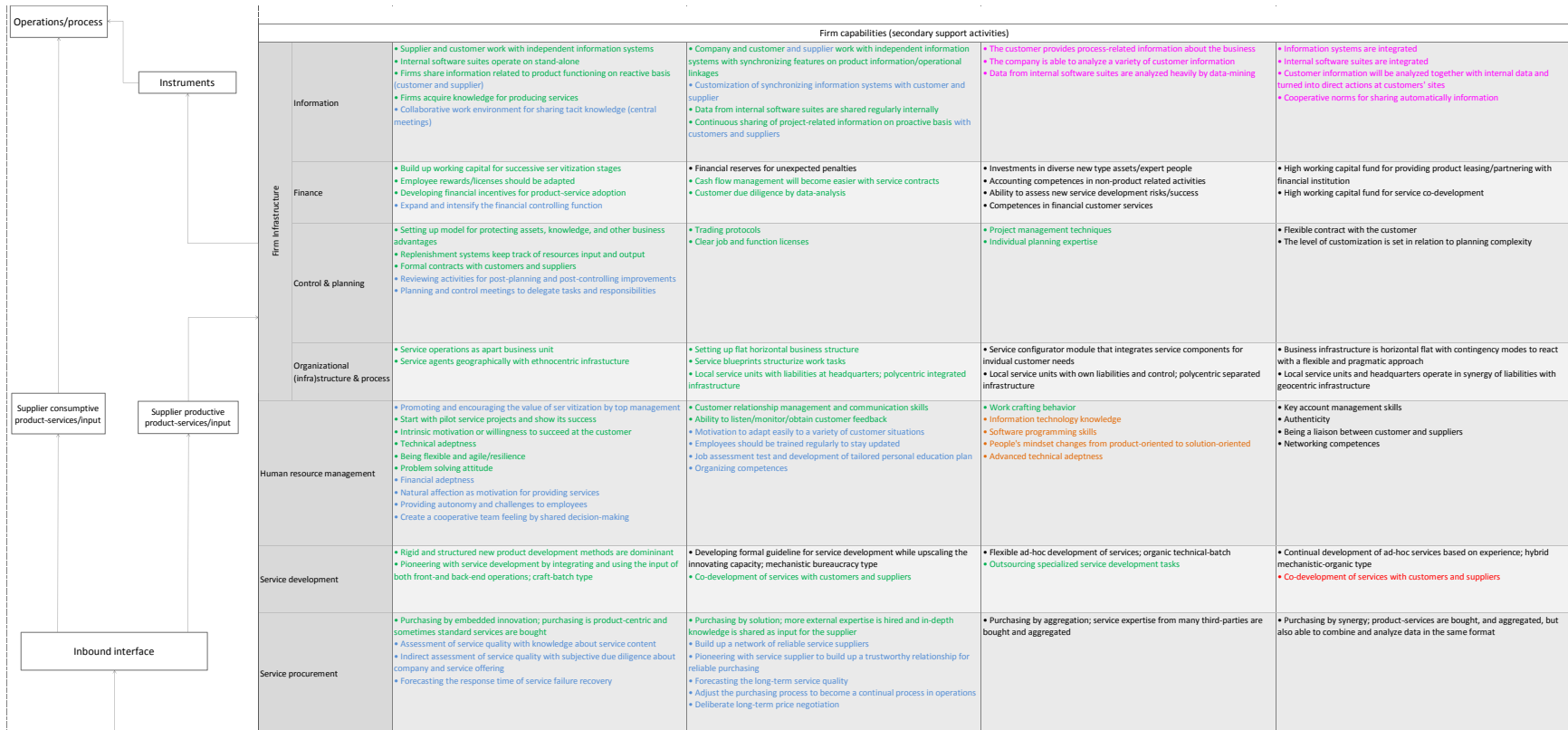
Table 7 Current and future position of cases on continuum



Appendix T

Validated concept for interorganizational servitization

Outbound interface	Product-service continuum downstream distributor	Product dominant & service add-on						Service dominant & product add-on	
	Type orientation means-end chain	Product-orientation (use-orientation)				Customer-orientation (result-orientation)			
	Type orientation time	Transactionship-based		Relationship-based		Transactionship-based		Relationship-based	
	Type orientation setup	Standard	Customized	Standard	Customized	Standard	Customized	Standard	Customized
		Output product-services							
Front-sale services	<ul style="list-style-type: none"> Product documentation Product transportation/logistics Product installation/commissioning Product demonstration Detailed financial cost calculation Temporary warehousing 	<ul style="list-style-type: none"> Product-project consultancy (documentation) Providing product customization options/R&D-product engineering Product-project engineering 	<ul style="list-style-type: none"> Product trial service 		<ul style="list-style-type: none"> Process or solution documentation Insurance policies 	<ul style="list-style-type: none"> Process-oriented engineering (tests, optimization, simulation) Full project engineering Process-oriented consulting Business-oriented consulting End-to-end responsibility for installation, integration & coordination Financial profitability consulting 			
After-sale services	<ul style="list-style-type: none"> User product-training Product service manuals (Safety) inspection/diagnosis Spare parts Reactive maintenance & repair Product updates/updates/refurbishing Recycling/taking-back service 	<ul style="list-style-type: none"> Hotline/(online) help desk Customized evaluation of the project 	<ul style="list-style-type: none"> Proactive/preventive maintenance Remote monitoring/regular performance audits Spare parts management Full maintenance contracts Product warranty Capital financing service for product Detailed financial cost calculation 	<ul style="list-style-type: none"> Product-project consultancy (documentation) Customized product software Regular customized evaluations or points of contact Regular reporting of product functioning 	<ul style="list-style-type: none"> Start-up assistance Work instructions Reactive response to solution failure Replenishment service by monitoring buying pattern 	<ul style="list-style-type: none"> Process-oriented training Business-oriented training Complete installation reactive maintenance (turn-key) Integrated solution upgrades (Safety) inspection/diagnosis of integrated solution 	<ul style="list-style-type: none"> Preventive response to solution failure Remote monitoring of integrated solution/regular audits Capital financing service/mortgages Managing maintenance function/administrative Performance guarantees/performance responsibility on operations or process output/pay-per-use 	<ul style="list-style-type: none"> Asset management Making production line planning Regular reporting/meetings Procurement of third-party service providers Administrative support Crew management 	
Value of services by customers	<ul style="list-style-type: none"> Reducing adoption risks/having a proper functioning product Having one point of contact 	<ul style="list-style-type: none"> Freedom of choice in services 	<ul style="list-style-type: none"> Reliable product performance and availability Relieving product lifetime worries 	<ul style="list-style-type: none"> Freedom of choice in services over a long term 	<ul style="list-style-type: none"> Relieving business-related tasks or uncertainty 	<ul style="list-style-type: none"> Having an integrated solution that is compatible with other systems 	<ul style="list-style-type: none"> Having state-of-the-art process Guarantees of running operations 	<ul style="list-style-type: none"> Getting tailor-made assistance in operations 	
Value of services by the company	<ul style="list-style-type: none"> Services are an essential part of total value creation Serve as reliable trouble-shooter Aid the buyer in product adoption/keeping off competitors in tendering 	<ul style="list-style-type: none"> Minimize costs on marketing & promotion 	<ul style="list-style-type: none"> Serve as performance enabler by assuring product functioning over time Increase customer revenues/stable cash flow/higher margins per offering Getting repeat orders 	<ul style="list-style-type: none"> Obtain customer feedback as input for R&D 	<ul style="list-style-type: none"> Solve customer problems non-product related Full control over customer demands 	<ul style="list-style-type: none"> Create a profitable end-to-end solution Deliver only value in use 	<ul style="list-style-type: none"> Co-production of services to create value Serve as trusted company Let customers profit from latest developments Stay in close contact with the customer 	<ul style="list-style-type: none"> Customers benefit directly from supplier development competencies Sustainable competitive advantages with tailored service offering 	
Type customer segmentation	<ul style="list-style-type: none"> Customer is self-reliant, keeping full-control over the business from end-to-end by minimizing upfront risks (contractors, low complex system) 		<ul style="list-style-type: none"> Customer is performance-oriented and wants to minimize as much technical trouble as possible (subcontractors, medium complex system) 		<ul style="list-style-type: none"> Customer will outsource non-regular tasks or peripheral activities that are difficult and risky to realize on their own (outsourcers, moderate complex system) 		<ul style="list-style-type: none"> Customer is focused on core business and daily operations with risks and responsibilities and low competitive advantages are outsourced (end-customers, high complex system) 		
Service marketing & distribution	<ul style="list-style-type: none"> Add-on services get individual marketing attention Services are mainly marketed by regular marketing/promotion Sales people are the central distributor of services 		<ul style="list-style-type: none"> Customization of marketing activities specified on customer position and lifecycle situation with interactive marketing Field service engineers and account managers are delivering services continuously 		<ul style="list-style-type: none"> Solutions are marketed with a combination of mainly services supporting product and process as one solution Sales consultants and engineering experts are delivering services 		<ul style="list-style-type: none"> Operation engineers and key account managers are managing the partnership relation continuously 		
Service pricing	<ul style="list-style-type: none"> Customer ownership of equipment Services are free or separately priced Custom-made efforts are priced separately 		<ul style="list-style-type: none"> Customer ownership of equipment TCO are priced in fixed SLA-contracts with product and service priced separately Pricing is customized over customers 		<ul style="list-style-type: none"> Customer ownership of equipment Products and services are priced as one integrated solution 		<ul style="list-style-type: none"> Supplier ownership of equipment Customer pays for performance, product and services priced in one package Sometimes the product is separately leased or rented 		
Service quality control	<ul style="list-style-type: none"> Quality norms for products and services Incoming quality inspection of purchased products and services Outgoing quality inspection of products and services Complaints handling protocols 		<ul style="list-style-type: none"> KPI indicators with measurement tools for maintaining quality Customer-satisfaction surveys Product performance guarantees 				<ul style="list-style-type: none"> KPI-indicators focused on customer value or performance 		



Supply chain interface					
Supply chain configuration	Becoming system integrator				
			• Introduction of simple integrated systems or set of semi-integrated complementary products	• Introduction of advanced integrated systems	
	Organic growth				
	Upstream integration of exclusive capabilities				
	Upstream integration of simple product or technical-oriented capabilities	Upstream integration of advanced product or technical-oriented capabilities	Upstream integration of simple business or customer-oriented capabilities	Upstream integration of advanced business or customer-oriented capabilities	
	Downstream integration of distributors				
	Strategic partnership between manufacturer and seller (partial outsourcing)				
	• Simple trading contract with standard rights and duties	• Trading contract with advanced rights and duties	• Partnership contract with influence on making strategic decisions	• Long-term partnership contract based on mutual cooperation under one customer brand	
	Supply chain relationship channels				
	Information	<ul style="list-style-type: none"> • Creating heterogenous set of customer installed base to minimize fluctuations in service needs • Increase customer loyalty and trust by forming the relationship with in-depth assessment of company profile, open communication, high responsiveness, and tailor-made solutions because of differences in culture or country • Real-time or proactive responsiveness with the customer to minimize disturbances in ad-hoc requests • Use of least amount mixture of different effective type communication channels • Minimize interpretation errors with personal contact, frequent communication or double-checks • Formal and informal mutual commitment/agreements • Use of least amount of communication lines per channel • Use of standard formats • Minimization of administration of inquiries • Clear non-disputable information packages • Confirmation on inquiry and order delivery • Use of internal communication policies • Uniform locations for storing information • Appoint and train the right contact persons or liaisons • Use of modern communication and visualization techniques 	<ul style="list-style-type: none"> • Balance backlogs of service demands to minimize order batching effects in terms of information processing • Forecasting future service demands and specifications of demand to minimize bulkship effects of higher frequency and amount of information by services and to minimize the probability of product-service rework • Advanced information system or platform channel (central meeting) or virtual work environment as extranet for co-creating services • Mobility features • Interface for supply chain updates from both parties • Tailored to and user-friendly for product-service environments • Creating an interface for obtaining feedback and input from stakeholders/two-way communication • Catalyze the supply chain relationship with horizontal cross-sharing • The information flow is more informal managed • Openness to share more sensitive information by services • Ability to assess the priority of service inquiry to response time • Provide forecasting information about service delivery by both parties • Alignment of working structures • Development of annual strategic plans • Information systems have synchronizing features 	<ul style="list-style-type: none"> • Ability to share customer-oriented information between supplier and distributor 	<ul style="list-style-type: none"> • Information systems share information within the same format and in real-time between supplier and distributor
Cash	<ul style="list-style-type: none"> • Minimize price fluctuations to minimize fluctuations in market demand by pricing • Alternative measurement tools to controlling the quality of service outcome and consequently the conditions for payment • Confirmation on inquiry and order of cash • Uncertainty modeling by application of probability theory because of increasing risks in accounts receivable with ser vization practices 	<ul style="list-style-type: none"> • Alternative payment model with timing, interval, and amount to increase and balance cash flow or work capital of downstream service provider 	<ul style="list-style-type: none"> • Openness of finances in supply chain partnerships to stabilize and control risks in service development and operations • Collaborative risk-based pricing method for co-development of services 		
Capital goods	<ul style="list-style-type: none"> • Agreements on work behavior, work requirements, and work responsibilities and costs • Capital goods should be made transportable and ready to be shared with the customer • Cross-training of employees on contingent situations • Shadowing of people on contingent situations 	<ul style="list-style-type: none"> • Fast mobilization capability of people and equipment 	<ul style="list-style-type: none"> • Higher frequency of people and equipment to be shared 	<ul style="list-style-type: none"> • Serve as distribution or pooling centre for sharing capital goods between multiple service providers 	
Product & spare parts	<ul style="list-style-type: none"> • Adaptation of logistic function to fast delivery of spare parts • Adaptation of the logistic function for bidirectional flow of products • Formal and informal mutual commitment/agreements • Confirmation on inquiry and order delivery • Sharing information about the transportation process • Fast internal responsiveness 	<ul style="list-style-type: none"> • Higher inventory buffer level to buffer the randomness of service encounter failure 	<ul style="list-style-type: none"> • Ability to identify and calculate with a complex network of transportation nodes 		



Outbound interface	Product-service continuum upstream manufacturer	Product dominant & service add-on						Service dominant & product add-on		
	Type orientation means-end chain	Product-orientation				Customer-orientation				
	Type orientation time	Transactionship-based		Relationship-based		Transactionship-based		Relationship-based		
	Type orientation setup	Standard	Customized	Standard	Customized	Standard	Customized	Standard	Customized	
	Output product-services									
	Front-sale services	<ul style="list-style-type: none"> Product documentation Product transportation/logistics Product demos Product demonstration User product-technical training Temporary warehousing 	<ul style="list-style-type: none"> R&D-product engineering Product consultancy Providing product customization options/R&D-product engineering Mobile assistance Customized product documentation 			<ul style="list-style-type: none"> Co-marketing services Co-sales services 	<ul style="list-style-type: none"> Complementary and compatible services 			
	After-sale services	<ul style="list-style-type: none"> Product service manuals Spare parts Product updates/updates/refurbishing 	<ul style="list-style-type: none"> Hotline/(online) help desk 	<ul style="list-style-type: none"> Product warranty 		<ul style="list-style-type: none"> Regular customized evaluations or points of contact 		<ul style="list-style-type: none"> Process-oriented training 	<ul style="list-style-type: none"> Product performance guarantees 	
	Productive services (out of line on the continuum)	<ul style="list-style-type: none"> Providing basic support with information capabilities Providing basic support with financial capabilities Providing basic support with organizational structure, process & infrastructure 		<ul style="list-style-type: none"> Providing support with information capabilities Providing support with software and knowledge Providing support with financial capabilities Providing support with organizational structure, process & infrastructure Providing support with service development Providing support with control & planning, HRM and service procurement 		<ul style="list-style-type: none"> Providing advanced support with information capabilities Providing advanced support with software and knowledge 				
	Value of services by dealers	<ul style="list-style-type: none"> Taking away marketing tasks 	<ul style="list-style-type: none"> Reduce risk and uncertainty in activities 	<ul style="list-style-type: none"> Services give company viability and competitive advantage Providing flexibility in resources/business continuity 	<ul style="list-style-type: none"> Give a strong customer impression 	<ul style="list-style-type: none"> Large assortment of available assistance Compatibility among services One point of contact with complementary product-services 				
	Value of services by the company	<ul style="list-style-type: none"> Services are an essential part of total value creation Aid the buyer in product adoption/keeping off competitors in tendering 		<ul style="list-style-type: none"> Increase customer revenues Strengthening the partnership structure by building trust, brand image, and loyalty to dealers 	<ul style="list-style-type: none"> Getting feedback as input for R&D 					
Type customer segmentation	Low-level service company		Medium-level service company		Moderate-level service company		High-level service company			
Service marketing & distribution	<ul style="list-style-type: none"> Add-on services get individual marketing attention Services are mainly marketed by regular marketing/promotion Sales people are the central distributor of services 		<ul style="list-style-type: none"> Sales support and account managers are delivering services continuously Regular networking and seminar meetings for distribution partners 		<ul style="list-style-type: none"> International lobbying for uniform legislation 					
Service pricing	<ul style="list-style-type: none"> Customer ownership of equipment Services are free or separately priced 		<ul style="list-style-type: none"> Customer ownership of equipment Pricing is customized over customer segments (country) and per individual customer 							
Service quality control	<ul style="list-style-type: none"> Quality norms for products and services Outgoing quality inspection of products and services Complaints handling protocols 		<ul style="list-style-type: none"> KPI indicators with measurement tools for maintaining quality Product performance guarantees 							

<p>Operations/Process</p> <p>Instruments/Capabilities</p>	Firm capabilities (secondary support activities)				
	Information	<ul style="list-style-type: none"> Supplier and customer work with independent information systems (customer and supplier) Internal software suites operate on stand-alone Firms share information related to product-functioning on reactive basis (customer and supplier) Firms acquire knowledge for producing services 	<ul style="list-style-type: none"> Company and customer and supplier work with independent information systems with synchronizing features on product information/operational linkages Customization of synchronizing information systems with customer and supplier Data from internal software suites are shared regularly internally Continual sharing of product-related information on proactive basis with customers and suppliers 	<ul style="list-style-type: none"> Data from internal software suites are analyzed heavily by data-mining The customer provides process-related information about the business The supplier is able to analyze a variety of customer information 	<ul style="list-style-type: none"> Information systems are integrated Customer information will be analyzed together with internal data and turned into direct actions at customers' sites Cooperative norms for sharing automatically information
	Finance	<ul style="list-style-type: none"> Employee rewards/licenses should be adapted Developing financial incentives for product-service adoption Expand and intensify the financial controlling function 	<ul style="list-style-type: none"> Cash flow management will become easier with service contracts Customer due diligence by data-analysis 		
	Control & planning	<ul style="list-style-type: none"> Setting up model for protecting assets, knowledge, and other business advantages Replenishment systems keep track of resources input and output Formal contracts with customers and suppliers Planning and control meetings to delegate tasks and responsibilities 	<ul style="list-style-type: none"> Trading protocols Clear job and function licenses 	<ul style="list-style-type: none"> Project management techniques 	
	Organizational (infra)structure & process	<ul style="list-style-type: none"> Service operations as apart business unit Service agents geographically with ethnocentric infrastructure 	<ul style="list-style-type: none"> Setting up flat horizontal business structure Service blueprints structurize work tasks Local service units with liabilities at headquarters; polycentric integrated infrastructure 		
	Human resource management	<ul style="list-style-type: none"> Start with pilot service projects and show its success Intrinsic motivation or willingness to succeed at the customer Technical adeptness Problem solving attitude Providing autonomy and challenges to employees Create a cooperative team feeling by shared decision-making Advanced knowledge in languages and cultures 	<ul style="list-style-type: none"> Customer relationship management and communication skills Ability to listen/monitor/obtain customer feedback Employees should be trained regularly to stay updated Organizing competences Persistence and perseverance Teaching skills 	<ul style="list-style-type: none"> Work crafting behavior 	
	Service development	<ul style="list-style-type: none"> Rigid and structured new product development methods are dominant Pioneering with service development by integrating and using the input of both front-and back-end operations; craft-batch type 			
Service procurement	<ul style="list-style-type: none"> Purchasing by embedded innovation; purchasing is product-centric and sometimes standard services are bought Assessment of service quality with knowledge about service content Indirect assessment of service quality with subjective due diligence about company and service offering Expanding the sourcing process for purchasing services 	<ul style="list-style-type: none"> Purchasing by solution; more external expertise is hired and in-depth knowledge is shared as input for the supplier Adjust the purchasing process to become a continual process in operations Deliberate long-term price negotiation 			

Table 8 Validated theoretical framework

Appendix U

Service-oriented design and development iterative cycle

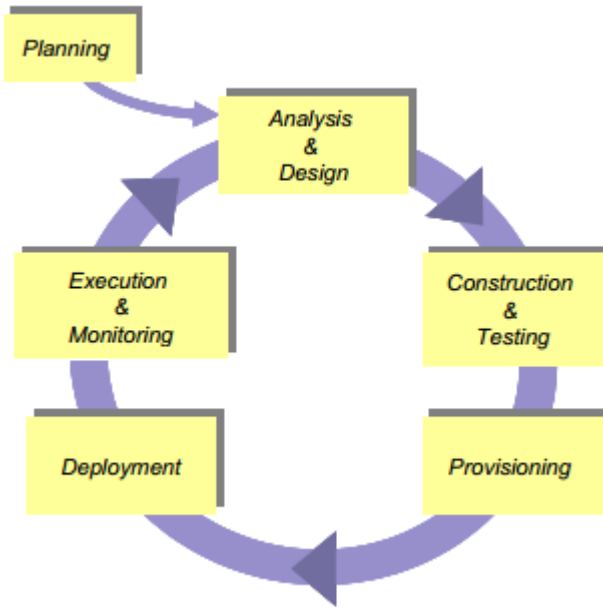


Figure 14 Service-oriented design and development iterative cycle (Papazoglou, & Van den Heuvel, 2006)

Appendix V Master thesis validity and reliability

Tests	Definition	Case study tactic	Phase of research in which tactic occurs	Extent of implementation in study
Construct validity	identifying correct operational measures for the concepts being studied	<ul style="list-style-type: none"> • use multiple sources of evidence • establish chain of evidence • have key informants review draft case study report 	data collection data collection composition	<ul style="list-style-type: none"> • Use of multiple sources of evidence with triangulation: interviews, archival data, observation • Topics of interest are asked from three perspectives: <ul style="list-style-type: none"> - What kind of services do you get from Alpha? - What kind of support in capabilities do you get from Alpha? - How do you manage the relationship with Alpha? • Key respondents are used responsible for the topics of interest at cases • Multiple key respondents are used within one case • Key informants reviewed initial solution • Use of chapters and bullets to create links between data and report chapters
Internal validity	(for explanatory or causal studies only and not for descriptive or exploratory studies): seeking to establish a causal relationship, whereby certain conditions are believed to lead to other conditions, as distinguished from spurious relationships	<ul style="list-style-type: none"> • do pattern matching • do explanation building • address rival explanations • use logic models 	data analysis data analysis data analysis data analysis	<ul style="list-style-type: none"> • Not critical to implement because of mainly explorative nature of study • Use of theoretical model derived from multiple sources of literature in study and field research • Explanation building and discussing rival explanations in cross-case analysis • Cross-case analysis of sources of evidence for identifying patterns
External validity	defining the domain to which a study's findings can be generalized	<ul style="list-style-type: none"> • use theory in single-case studies • use replication logic in multiple-case studies 	research design research design	<ul style="list-style-type: none"> • Large amount of cases are used for analysis of the downstream supply chain • Cases are selected on heterogeneity criteria to increase generalizability • A literature study is held to connect new and old findings
Reliability	demonstrating that the operations of a study, such as the data collection procedures can be repeated, with the same results	<ul style="list-style-type: none"> • use case study protocol • develop case study database 	data collection data collection	<ul style="list-style-type: none"> • Semi-structured interviews are used for repeatability • Use of pre-test for right interpretation of research questions • A database with all collected data is kept to enable repeatability

Table 9 Quality criteria for case study research design