Antti Törrönen

Customer Value Proposition for ABB Marine Electric Solutions

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Metropolia

After a few years of contemplating the issue and waiting for the correct time, in 2019 I finally decided to go for it and applied to the Industrial Management Master's program in Metropolia University of applied sciences. I possessed a strong technical background and was already accustomed to lead the engineering process in my current role as Lead Engineer in ABB Marine. The economic and strategic management side of the business had however evaded me for too long. The industrial management studies were the missing piece in my overall professional competence.

In this journey of personal professional development, the first thanks go to my direct supervisor in ABB Marine the Engineering Manager Atte Piiroinen. Without his understanding of the peoples need to better themselves and his continuous support in this venture I would never have had the opportunity to create this thesis. In addition, I would like to convey my gratitude to all of my colleagues who took the time from their busy schedules to support me in the thesis research as informants and work group members. Finally, from ABB Marine I would like to extend my gratitude to Matti Silvennoinen the Vice President of Electric solutions for his contribution in the thesis validation.

As the thesis work was not limited to my place of business, but rather presented an opportunity to build together with our customers, I would like to voice my sincere appreciation to all the customers who participated in the thesis research. Many of the shipyards were extremely busy at the time but still managed to find time to enlighten me about their values and to co-create the outcome of this thesis. Some of the shipyards additionally provided valuable customer validation for the development actions of this thesis.

During the thesis research all of my time was split between work, school and family. It gives me great pleasure to state that the considerable efforts of the faculty members Juha Haimala, Thomas Rohweder, Sonja Holappa and James Collins to produce top quality education and mentoring was highly appreciated. Of course, thanks go especially to my thesis instructor James Collins for his personal support in the thesis development process. Finally, a special thanks goes to my wife who supported me throughout this time and encouraged me to continue in my path to Master of Engineering.

Antti Törrönen
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This thesis focuses on the customer values of the ABB Marine Electric solutions department. The increased competition on the marketplace has pushed the case company to re-evaluate their business offering. The case company's critical competitiveness has always been built on distinctly higher quality and superior customer service it offers to the select key customers. However, as the ultimate judge of the quality and customer service are the customers, the CVP of the key customers' needs to be revised periodically. The objective of this thesis is to re-build a co-created improved customer value proposition which answers to the current market situations.

The research to the CVP development follows design research method which is well suited for a practical business challenge where existing theory is applied in order to develop new information. The thesis research is carried out mostly as qualitative research where informants from the case company and customer side are interviewed in a semi-structured manner. Although, the main focus of the research was on the case company's business relationship with the shipyards who represent tier 1 customers, a vessel owner representative was also interviewed. In addition to the interviews competitor publicly available documents were researched in order to deconstruct their customer value proposition. Finally, the initial proposal was first developed in a Lead engineer work group and then validated in a management meeting.

The research revealed that the current customer value proposition utilized focuses mainly on the tier 2 customers and provides little tangible values to the shipyards. The current state analysis identified eight high priority weaknesses in the case company CVP. The weaknesses were triangulated from multiple customer interviews and supported by the case company sales department interviews and the competitor offering analysis. The Lead engineer work group developed practical actions for the top six weaknesses and proposed new customer benefits that may be derived from the actions. The initial proposal was next further enhanced by comments from the interviewed customers and case company management. Final proposal consists of four sales arguments for the new improved CVP, 6 new strengths, 6 formative actions, 6 new customer benefits and a communication plan to rise the customer awareness of the improvements. This new customer value proposition will help to fulfill new customer values and provides the commercial justification for the high quality, high value products sold by the case company.

Keywords	CVP, Marine, ABB

Contents

1 Introduction

The marine industry is a world with a lot of old traditions and regulations, which are partly governed by the ghosts of the past. The industry changes its course very slowly and remembers the teachings of past tragedies. Although resistance to change and evasion of technological advances have been in the heart of the industry for a long time, it is now finally ready to adopt new technology. In the near future, the shipbuilding industry may even be the front runner in the next generation zero emission technology.

The shipyard is a muster station of hundreds of independent equipment suppliers and contractors. Large vessels are comparable to small floating cities where all utilities and services, which we take for granted on shore, must be produced locally. There is also an intrinsic need for redundancy of critical systems. If one system fails, there are one or two independent other systems that can be used for the same operation. These parallel systems exist to avoid a situation where the captain, for any reason, loses the control of the vessel.

New modern ships will be equipped with a strong electric backbone, that energizes all the vessel's utilities, from the mighty propeller, which pushes the ship forward, to the gently illuminating red ambient light on the command bridge. The electric backbone consists of an electric powerplant and power distribution equipment, that provide suitable energy for different consumers. None of these systems can operate alone, independent from control, monitoring or care. Everything is tied together with automation and control systems, that transform the independent equipment to a collaborative and automated electric solution.

The shipyard must provide their customer, the ship owner, with a vessel that fulfills the classification society rules, international agreements, flag country regulations and the customer's specification. There are hundreds of systems that must be procured from suppliers and integrated together. Some specialty products, like the Azipod ®, are practically without a considerable rival manufacturer. If these products are specified by the ship owner in the specification, the shipyard has one less supplier to choose and one more monopoly to handle.

The case company of this thesis, ABB Marine, is a supplier of the Azipod ® propulsion system, which combines the traditional rudder and the ship's propeller to a massive under water "torpedo", which pulls the ship forward to a chosen direction. ABB Marine also has a very wide range of other electric equipment in its offering, which cover many of the critical systems on board. If so specified, these systems can be designed to exceed all redundancy requirements and provide unparallel integration and controllability. It all depends on what the customer values.

1.1 Business Context

The case company ABB is a large multinational conglomerate with over 160 000 employees and operations in five continents. The ABB group is divided in the following business segments: electrification, industrial automation, motion, robotics and discrete automation and power grids. All of these business segments revolve around the same topic: electricity. ABB could be described as a collaborative group of different product and service providers guided by a common corporate strategy, leading everybody towards the same goal. This thesis focuses on the customer value proposition of 'Electric solutions' department of Marine & Ports division, which belongs to the Industrial Automation business segment.

In the ship building industry ABB Marine is one of the leading providers of electrical power distribution and automation systems. The Marine division is divided to Electric solutions, Propulsion solutions and Digital solutions the departments. Together these departments provide products and services from bridge to propeller. The Propulsion solutions department designs and manufactures custom built Azipod ® propulsion systems, which provides thrust and steering to the vessel. Digital solutions then provide the tailor-made ABB control and automation system, which provides the captain and crew optimal means of operating the vessel. Finally, the Electric solutions department makes it all run by acquiring the powerplant and distribution equipment from other ABB divisions and designing the communication between all the ABB devices. Electric solutions also assume the overall responsibility of the delivered ABB systems and guarantees seamless integration of the different functionalities.

1.2 Business Challenge, Objective and Outcome

ABB Marine faces three main challenges in its current market position: higher price than competitors, increased competition and the image of having too much influence in the market. The Electric solutions department does not manufacture anything. It procures generators, motors, transformers, UPS:s, switchboards, drives, batteries, fuel cells, soft starters and many other electric grid components, and provides an integrated solution, which fits to the Digital- and Propulsion-solution departments offerings. The majority of the products procured are from ABB factories, which are provided to the shipyard with a small ABB Marine margin on top. The ABB Marine strategy is not to be the cost leader in the segment and therefore it is not competing with the most tangible element, which is price. ABB Marine's critical competitiveness is built on distinctly higher quality and superior customer service. There is no ABB standard. There is the customer need, which the overall solution strives to fulfill. Unfortunately, the product price needs very few explanations as compared to the value created with the superior integration of the purpose-built equipment. The challenge is to clearly quantify to the customer what kind of value is created when the ABB equipment features are combined and integrated together.

ABB has the strongest position and largest selection of products for the ship building industry. In addition, ABB also has very strong ties to the ship owners and is even able, to some extent, to force its way to the shipyard negotiation table, by having the only product, which fulfills the owner's specification. Independent shipyards may see ABB's pricing and behavior on the market as slightly arrogant and are therefore reluctant to increase ABB's influence by including everything that ABB is offering to the contract's scope of supply. Power grid components and system integration are seen as the easiest to be divided to separate contractors to decrease the cumulation of responsibility to a single supplier. The challenge is to show the shipyard how the ABB power grid equipment features clearly bring intrinsic value to the overall integration.

The integration of the equipment is all about knowing the functions that the equipment must perform and how these functions should communicate to external systems. First it must be decided where the control signals should come and where the indication should go. Then a communication network should be designed to facilitate this communication. This can be seen as a job, that could be outsourced e.g. to a consulting company, which analyses the specifications and functional descriptions, and provides a cabling plan how to connect the equipment. The challenge is to show how ABB is able to utilize superior communication methods between ABB equipment and provide additional value on top of the equipment cabling plan.

Considering the above business challenges the objective of this thesis is to establish an improved CVP to ABB Marine Electric solutions department.

The outcome of this thesis is an ABB Marine electric solutions CVP.

1.3 Thesis Outline

The scope of this thesis is limited to the development of a renewed CVP model for the case company's Electric solution department. The scope does not include considerations of products and services, which the electric solutions department is not responsible for. This thesis is written in seven sections. The first section provides a general overview of the business segment and information about the business context, business challenges and the objective and outcome of this thesis. The second section describes the research design and methods used for data collection. The third section explores reliable literature sources in regard to the concept and utilization of CVP and establishes a conceptual CVP framework for this thesis. The fourth section provides findings from the current state analysis of existing ABB Marine electric solution customer value proposition. The fifth section describes the initial proposal for the CVP based on the findings from current state analysis and conceptual framework. The sixth section reports the feedback collected from the first review of the initial CVP by the key stakeholders in the case company and presents the final version of the improved CVP. The seventh and final section includes the executive summary of the thesis, guidance towards implementation of the renewed CVP and evaluation criteria of this thesis.

1.4 Key Concepts

The following key concepts are frequently used in this thesis:

Customer Value Proposition (CVP): The total value provided by the supplier to the customer in the offerings.

Potential value: Expected value by customers or promised value by the supplier during the exchange process

Value-in-Use: The real value created by customers, either independently or collaboratively with the supplier (during the use of the products and services)

Propulsion: Act of moving or pushing an object forward. A propulsion system is an engine that produces thrust to push an object, such as a vessel forward.

2 Method and Material

This section first describes the research approach chosen for this thesis. Next, the research design possibilities are illustrated in Figure 1, detailing how the study was conducted and how data was collected. Finally, this section finishes by presenting the data plan detailing what kind of different data was collected and when.

2.1 Research Approach

Data collection and data analysis are at the centre of all research. Saunders et al. (2007) divides research in to five layers of choices to be made when launching a new research. These five layers are illustrated in the Figure 1 below.

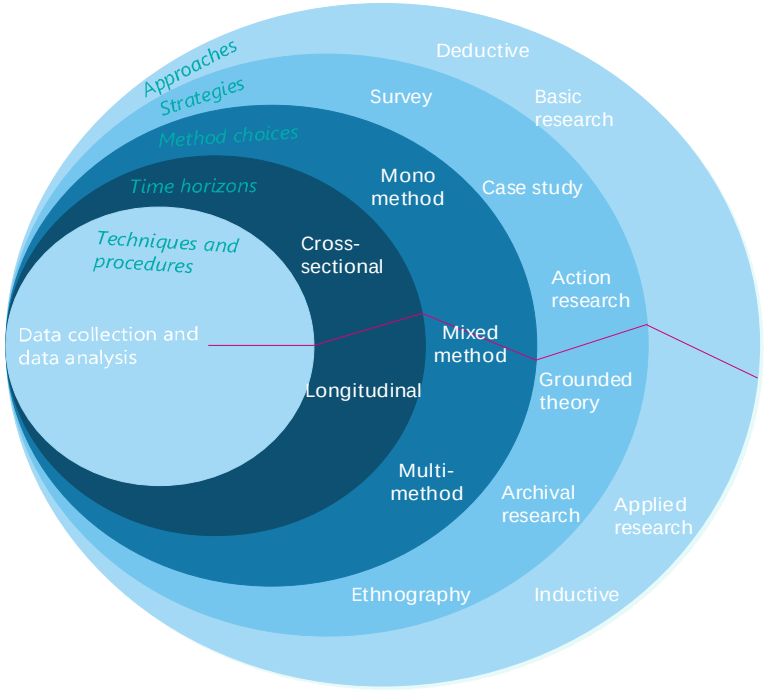

Figure 1: The research onion (Saunders et al. 2007)

The outer layer of the Figure 1 above represent the selection of the research approach. The research design can be divided into two different approaches based on if the theory is known, or if the theory is the actual subject of the research. One of these approaches is not better than the other. They are just utilized in different applications. Basic research utilizes a deductive method to test a theory. The research begins with a hypothesis and a strategy to validate or disproof it. According to Saunders et al. (2007) the first step is to deduct a proposition how different variables or concepts influence each other. The next step is to express the hypothesis in operational terms by specifying exactly what should be measured and how. Once the measured variables are

quantified, one or more suitable research strategies are chosen, and the hypothesis is tested. Finally, the results are interpreted, and depending on the findings, the hypothesis is proven, adjusted or disproven. If the hypothesis is adjusted, the research cycle is repeated.

Applied research utilizes an inductive method where an existing theory is used to produce new knowledge, which is documented by scientific methods. The results of the applied research are tied to context and do not need to be generally applicable. Many different research methods are differentiated below the applied research umbrella. Kananen (2013) describes the subtle differences between applied action research and design research. Design research is development work that aims to improve an organization's operation with scientific methods. The development work might be limited to the development of the solution and does not necessarily include the implementation. Action research always includes the implementation of the solution and development cycles where the effects of the solution are evaluated, and the solution improved.

Once the research approach has been decided the next layer in the Figure 1 above is the selection of research strategy. Saunders et al. (2007) considers 6 research strategies, which may be utilized depending on the chosen research approach. Deductive and basic research approaches adapt primarily survey, case study or action research strategy. Applied research and inductive research approaches adapt primarily grounded theory, archival research or ethnography research strategy. The researcher may consider one of these strategies or a combination of multiple suitable strategies. Once the research strategy is decided the researcher must decide how to approach the subject matter. Research can be done cross-sectionally or longitudinally. Cross-sectional analysis covers the subject widely, not deep diving to a specific area or time period. Longitudinal analysis focuses on a narrow segment and deep analysis of the subject matter.

The selection of the research approach, strategy and method can be made based on the research questions and the objective of the study. Applied research is typically a practical and the results have direct relevance to the person who has commissioned the study. For this thesis design research method was chosen, as there is a practical business challenge to which an existing theory is applied in order to develop a new customer value proposition.

2.2 Research Design

As described in section 2.1 this thesis study follows the design research approach and therefore aims to change the status quo of the customer value fulfillment assumptions. The case company assumes that the current product offering fulfills the customer needs. Figure 2 below illustrates the research design which provides the firm research structure that is strictly followed to the outcome described in the Chapter 1.2.

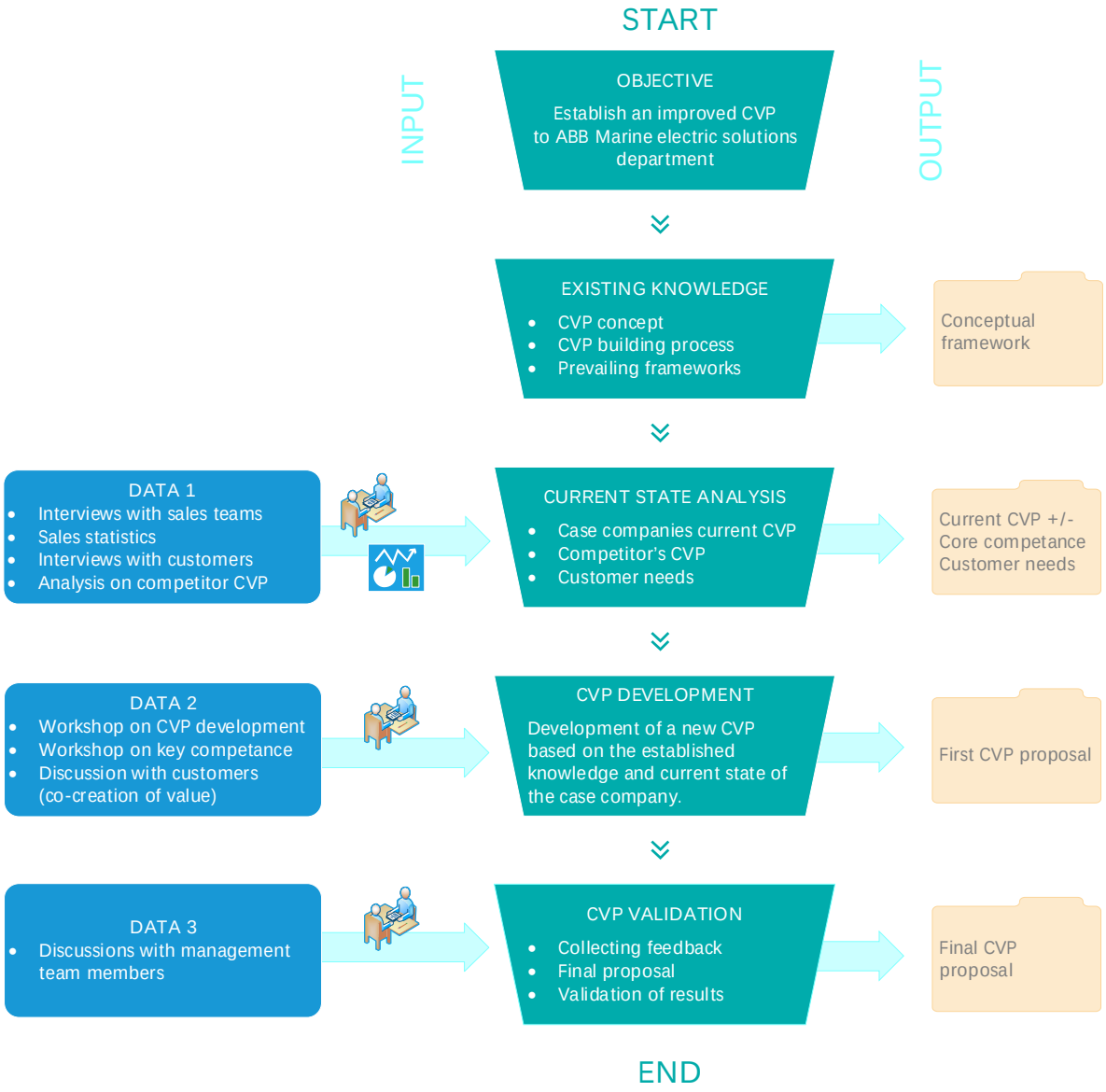

Figure 2: Research design diagram

The study is divided in to five phases, starting with a statement of objective and ending with the CVP development and validation. There are three separate data collection stages. The data collection follows mainly qualitative research methodology, although some quantitative research is done in order to see the trends of the sales efforts. In order to ensure the best possible focus for the qualitative research, the literature review is conducted before the current state analysis in this study. Figure 2 above illustrates how the study progresses (from up to down), and what data goes in and comes out (left to right).

As depicted in Figure 2, in order to assure the validity of the research, this thesis uses triangulated data collected in three separate stages. First, input data is collected from customer and sales manager interviews to capture the status of the current CVP of the case company. In this phase the case company's related strategy and sales statistics are also analyzed in order to get a clear picture of the management targets and current sales trends. The second round of interviews and workshops are organized to support the new CVP development. Finally, feedback is collected from the members of the case company's management team to finalize and validate the new improved CVP.

The outcomes 1-4 shown on the right side of Figure 2 each have a crucial role in building the final outcome of this thesis. In the 'literary review' (phase 2) existing knowledge from respected scientific sources are researched for an applicable theoretical base. As a first outcome a conceptual framework is established as a basis for the study. In the next phase the customer expectations and needs are examined and compared to the case company's current CVP. Based on the gathered data (Data 2) the first proposal for the new CVP is prepared and presented to members of the management team members. Finally, after validation based on the management team member feedback and customer comments, the final version of the CVP is published.

2.3 Data Collection and Analysis

This study draws from a variety of data sources and collected data in several data collection rounds. In all the interviews and workshops, the author has taken the role of *participant observer* as described by Saunder, Lewis and Thornhill (2007). The interviews, to which support questions were created, constitute the primary method of data collection. In order to gain the thrust and cooperation of the interviewees author has disclosed the purpose of my inquiries to all participants. It is known that the observer will always have some effect to the gathered data. In order to have as little influence on the gathered data as possible the author has adopted the position of being "all things to

all people". While suppressing personal points of view and minimizing the influence of personality the quality of the data is enhanced. The below Table 1 shows the important variables for the gathered data.

Table 1: Details of interviews, workshops and discussions in Input data

	Participant/ Source	Data type	Topic/ content description	Time	Documentation
	Data 1, for the Current state analysis (Section 4)				
1	Sales manager 1	Phone Interview	The case company sales strategy and key competences	February 2020	Field notes and recording
2	Sales manager 1	Phone Interview	The case company sales strategy and key competences	February 2020	Field notes and recording
3	Sales support engineer 1	Phone Interview	The case company sales strategy and key competences	February 2020	Field notes and recording
4	Sales support engineer 2	Phone Interview	The case company sales strategy and key competences	February 2020	Field notes and recording
5	Customer 1 (tier 1)	Face-to-face interview	Customer needs and values	January 2020	Field notes and recording
6	Customer 2 (tier 1)	Face-to-face interview	Customer needs and values	February 2020	Field notes and recording
7	Customer 3-4 (tier 1)	Face-to-face group interview	Customer needs and values	February 2020	Field notes and recording
8	Customer 5 (tier 2)	Phone Interview	Customer needs and values	February 2020	Field notes and recording
9	Competitor 1 brochure 1	PDF document	Competitor CVP	February 2020	document
10	Competitor 1 brochure 2	PDF document	Competitor CVP	February 2020	document
11	Competitor 2 brochure 1	PDF document	Competitor CVP	February 2020	document
12	Competitor 2 brochure 2	PDF document	Competitor CVP	February 2020	document
13	Competitor 3 brochure 1	PDF document	Competitor CVP	February 2020	document
14	Competitor 3 brochure 2	PDF document	Competitor CVP	February 2020	document
15	Competitor 3 brochure 3	PDF document	Competitor CVP	February 2020	document

	Participant/ Source	Data type	Topic/ content description	Time	Documentation
	Data 2, for Proposal building (Section 5)				
16	Lead engineer work group	Skype video conference	Case company weaknesses analysis and strength development	March 2020	E-mail replies
17	Customers 1-4 (tier 1)	E-mail open format questioner	Proposal validation	March 2020	Field notes
	Data 3, from Validation (Section 6)				
18	Case company Management	Group interview/ Final presentation	Validation, evaluation of the Proposal	April 2020	Field notes

As seen in Table 1 above, data for this project was collected in three separate rounds. The first data collection round was conducted for the current state analysis. The first round focused on face-to-face and phone interviews of the senior sales manages, sales support team members and key customers. The case company sales team interviews provided insight to the sales strategy and key competitive edge utilized on the sales efforts. Interviews with our immediate customers (tier 1), the shipyard representatives, provided direct knowledge of the customer needs and values. The ship owner who represents the end customer (tier 2), provided further information about the features and services which provide the most value to the product operator. The questions for the interviews 1-8 can be found in Appendix 1.

The second data collection round was conducted for the CVP proposal building. The second round focuses on workshops with the lead engineer team. The target was to engage the end customer in co-creating the new CVP. This provides the study real legitimacy as the customer has been involved in the new CVP creation. In the engineering workshop technical details related to the product features were discussed to harmonize the case company offering to better fit to the customer needs. In addition, feedback was gathered to recognize the changes which are feasible to carry forward to the new CVP. Field notes of the work group meeting are included in the Appendix 3. In addition, as part of the Data 2 the lead engineer workgroup results were validated with the tier 1 customers interviewed for the current state analysis.

The final data collection round was conducted to validate the proposal for the new CVP. A video conference meeting was organized with the case company management and a preliminary version of the thesis study was provided in advance. In the meeting the study was presented with the support of a PowerPoint presentation and feedback was gathered to finalize the thesis. Field notes of the meetings are not included as ap-

pendix as the data is not categorized or otherwise filtered. All comments and suggestions given by the case company management informants are included in the Chapter 6.2.

In addition to the interviews in the data collection round 1 this thesis includes quantitative research using the case company confidential internal documents and qualitative study of available competitor documents. Documents used in the current state analysis are listed in Table 2 below.

Table 2: Documents used in current state analysis

	Name of the document	Number of pages	Description
A	GE sales brochure Transforming the Marine ecosystem	2 pages	Sales document describing the company's competitive edge
	Source https:l/www.gepowerconversion.com/inspireltransforming-marine-ecosystem		
B	GE sales brochure Propelling towards to cleaner and more efficient future of cruise	3 pages	Sales document describing the company's competitive edge
	Source https:l/www.gepowerconversion.com/press-releases/propelling-towards-cleaner-and-more-efficient-future-cruise		
C	Siemens sales brochure SISIHIP solutions for shipping	28 pages	Sales document describing the company's competitive edge
	Source https://assets.new.siemens.com/siemens/assets/api/uuid:d1dfe300-7eaa-4c50-bf63-db794722f703/version:1579002533/vrms-b10007-00-7600-ws-siship-solutions-72.pdf		
D	Siemens sales brochure Solutions and products for power generation and distribution	17 pages	Sales document describing the company's competitive edge
	Source https:l/new.siemens.com/global/en/markets/marine/power-generation-and-distribution.html		
E	Wärtsilä sales brochure Diesel-Electric propulsion systems	7 pages	Sales document describing the company's competitive edge
	Source https://cdn.wartsila.com/docs/default-source/product-files/electric-propulsion-and-drives/brochure-o-ea-diesel-electric-propulsion-systems.pdf?sfvrsn=15f6ae45_6		

F	Wärtsilä sales brochure Ferry solutions by Wärtsilä	7 pages	Sales document describing the company's competitive edge
	Source https://cdn.wartsila.com/docs/default-source/marine-documents/segment/brochure-cruise-ferry-ferry-solutions.pdf?sfvrsn=14eedb45_14		
G	Wärtsilä sales brochure Cruise & Passenger ship new builds	2 pages	Sales document describing the company's competitive edge
	Source https://cdn.wartsila.com/docs/default-source/marine-documents/segment/cruise-passenger-ship-new-builds.pdf		

The key competitors sales materials, depicted in Table 2, are researched to deconstruct the CVP they base their sales efforts on. Quantitative research of the case company's internal documents compares the case company strategy targets to current sales trends in order to determine the gap between the current sales trends and the expected results of the new CVP. As the case company documents are considered confidential and are not used in the development of the improved CVP they are not included as appendix. Competitor sales documents listed are publicly available from the web address stated in Table 2. This completes the Methods and material section. The next section focuses on the literary review of key scientific sources related to the subject matter.

3 Existing Knowledge On CVP

First, this section elaborates on the key concept definitions which build up to the customer value proposition conceptual framework. These key concepts need to be explored in order to build a common understanding of the basic building blocks of the framework. Next, this chapter introduces the prevailing views on building the CVP, and the different elements included in the building process. Finally, the CVP conceptual frame which is best suited for this study is further explored. The conceptual framework developed in this chapter is guiding the research in the following two chapters. Data collection questions and methods described in chapter 2.3 are developed based on the conceptual framework established in this chapter.

3.1 Customer Value Concept

According to Khalifa (2004) the concept of *value* itself has many different definitions as it has roots in many different disciplines including phycology, economics, marketing and management. Even though the focus in this section is directed to the *customer value,* there are still multiple respected views on the definition of the concept. Below is a few scholarly definitions of the *value* and *customer value* constructs.

“Value is the consumer’s overall assessment of the utility of a product based on perception on what is received and what is given.” (Zeithaml 1988)

“Customer value is the emotional bond established between a customer and a producer after the customer has used a product or service produced by that supplier and found the product to provide an added value.” (Butz and Goodstein 1996)

“Value in business markets is the perceived worth in monetary units of the set of economic, technical, service and social benefits received by a customer in exchange for the price paid for a product.” (Anderson, Chintagunta and Jain 1993)

There are three common elements in most of the customer value definitions. First, customer value is always perceived by the customer and therefore cannot be determined by the seller alone. Next, customer value is also always linked to a product or service. Finally, customer value is a trade-off between the seller and customer. The customer gets e.g. a superior quality item as a trade-off of a longer delivery time and higher price. According to Martti Lindman (2010), customer value definitions can be grouped in to three different categories based on the differences in the definitions. The first category is the value-component definitions, where the entire customer value derives from the product features (ranking from delighters to dissatisfiers). The second category is

the benefits-costs definitions, where customer value is seen as balance between the product price and expected total benefits. The third category is the means-end definitions, where customer value is created based on how well the product enables the customer to reach set goals. None of these categories are mutually exclusive as there is wide overlap between them. Each definition places the emphasis on a different value dimension. The following paragraphs further clarify one of the more complex, means-end customer value definitions, which is designed for B2B companies.

Woodruff and Gardial (1996) propose that customer value is not only the economical price that the customer pays as an exchange for a product or a service with agreed features. They define customer value as "the customer's perception of what they want to have happen (i.e., consequences) in a specific use situation, with the help of a product or a service offering, in order to accomplish a desired purpose or goal". This definition has the core idea that the product generates value for the customer only in a particular "use situation" through a delivery of consequence. The customer makes a value judgement every time the product is used, based on the product's functionality compared to the customer's goals as depicted in Figure 3.

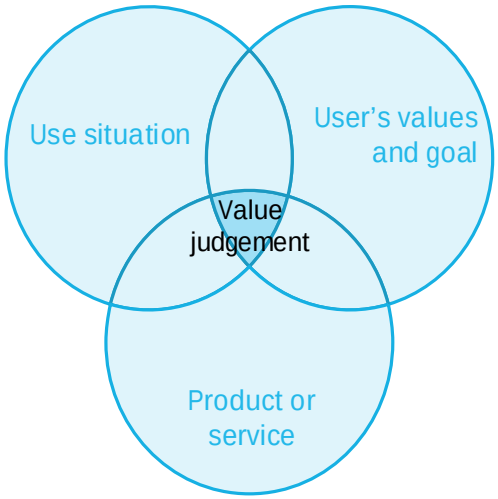

Figure 3: Value judgement decision

The value created in the above described "use situation" can be considered as *value-in-use.* Woodruff and Gardial (1996) also recognize that value can be created by only possessing a product or service. Some products encompass intrinsic symbolic, self-expressive or aesthetic qualities which create value to the customer by ownership or association. This value can be considered as *possession value*. Possession value is closely linked to "pride of ownership", which may also be linked to the product's monetary value. These two halves of the value concept are not mutually exclusive. A product or a service can deliver both value-in-use and possession value.

While a product may have only *possession value*, the total value judgement changes as the product is in a *use situation*. These important *use situations* are described by Woodruff and Gardial (1996) as *occasion triggers.* In these points the customer experiences a positive or a negative consequence from product or service use, and the customer value judgement is changed accordingly. The negative use situation may not be related to the product or service as the customers may also have changed the intended goal. It is important to react quickly to these *occasional triggers*, as there is a downward spiral effect once a negative consequence has been experienced. In the worst case the downward spiral causes the suppliers brands de-appreciation and termination of business relations with the customer. All the negative and positive consequences sum up to customer value and determine how well the customer's goals are met at the end.

One of the most renown modern approaches to value creation is the value sphere model by Grönroos and Voima (2012), depicted in Figure 4. This model deep dives to the value-in-use process and strives to clearly define the roles of the customer and producer in different stages. In Figure 4 the value creation is divided in three separate spheres that represent the different stages of the customer-producer relationship. The overlap of these spheres is very industry specific. In some companies there is very little co-creation of value and the intersection area of the provider and customer spheres in negatable. However, it is also possible to have very extended common product or service development period which widens the joint sphere area. Regardless of the industry all three spheres can be found in all commercial interactions where goods and services are exchanged for money.

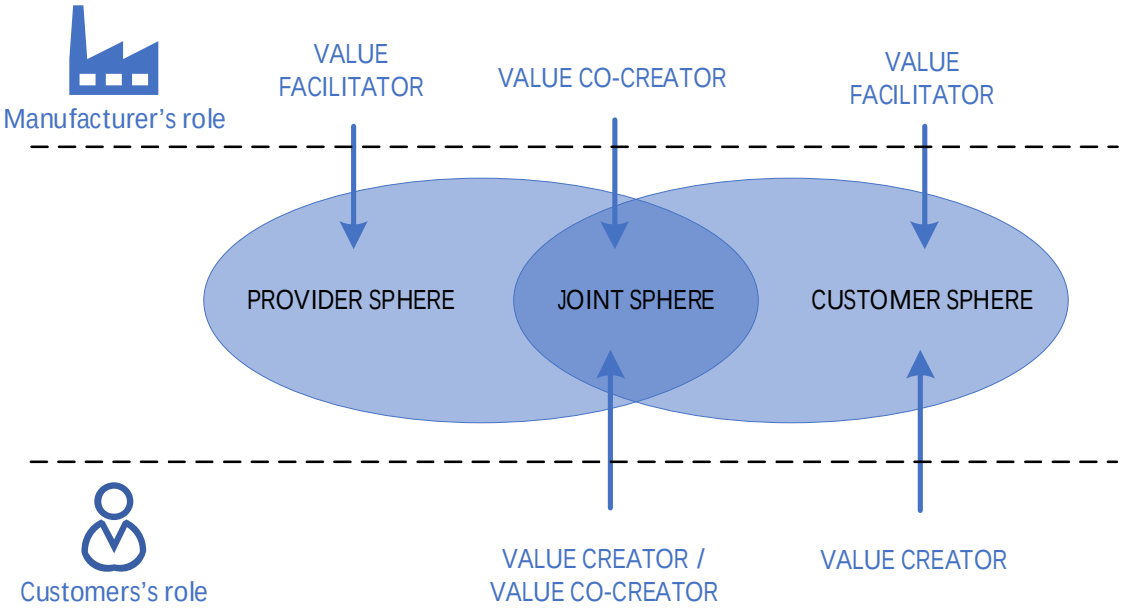

Figure 4: Value spheres (Gröroos and Voima 2012)

The provider sphere represents the stage where the product is under manufacturing and there is no customer contact yet. In this sphere the manufacturer (provider) is the value facilitator and creates potential value which may be used by the customer later to create value-in-use or possession value. The joint sphere is in the intersection of the provider and customer spheres. In this stage value is created when the customer is in direct interaction with the manufacturer. Therefore, the manufacturer has the opportunity to be included as the value co-creator, if a direct dialog is opened with the customer. However, first the manufacturer should comprehend how to be part of the customer's value creation process. Finally, in the customer sphere the manufacturer has only a passive value facilitator role as the customer is the independent value creator. In the customer sphere the value-in-use emerges from the accumulation of user experiences. (Grönroos and Voima 2012)

Given the complex nature of the *customer value* construct it may not be possible to explicitly measure the value experienced by the customer in a certain point in time. However, according to Smith and Colgate (2007) it is possible to understand the value dimensions which build up to the customer's perceived value over a long period of time. These value dimensions can be used as a basis for the value proposition framework. The next subsection describes what measurable value dimensions (value benefits) can be utilized in the formation of a customer value proposition.

3.2 Value Dimensions and CVP Concept

Similarly, to the customer value construct, there is no commonly accepted definition of the customer value proposition. The CVP concept has evolved through the years since its early conceptualization in the early 80's. Park, Jawarski and Maclnnis (1986) divides the customer value in functional, symbolic and experiential value dimensions. The customer's *functional needs* are satisfied by the manufacturer's product features that fill the customer's consumption needs. *Symbolic needs* are satisfied by a product which provides value to the customer simply when the product is possessed by the customer. *Experiential needs* are fulfilled when the manufacturer's product creates value to the customer when the product is in use.

Jagdish, Newman and Gross (1991) categorize customer value in a similar way - in functional, social (symbolic), emotional, epistemic and conditional (experiential) value dimensions. This categorization draws from the earlier definitions and recognizes two completely new value dimensions. Emotional value is created when the product triggers an emotional response e.g. comfort, security, fear or satisfaction. Epistemic value is created when a product arouses curiosity, provides knowledge or validation of knowledge.

Woodall (2003) divided customer value into five categories with focus on the benefits and sacrifices perceived by the customer. The first category is *net value for customer* which represent the product's feature's balance of sacrifices and benefits. The second category is *derived customer value* where the value is created in the user experience of the product. The third category is *marketing customer value* which is created as the customer perceives expected product attributes. The fourth category is *sale customer value* which represents a sacrifice, or a cost, related to the transaction. The fifth category is the *rational customer value*, which includes the customer's assessment of the transaction's fairness.

Osterwalder et al. (2014) prepared a simple tool for CVP creation which divided the customer value in gains and pains. This simple division follows the means-end definition of value. The customer value outcome, which is perceived beneficial by the customer is considered a gain. The customer value outcome, which is perceived to cause a negative result is considered a pain. Emphasis is placed on viewing the relationship from the customer's perspective and gaining deeper understanding of the customer's value drives.

Payne, Frow and Eggert (2017) have divided all the CVP definitions in three separate categories. The first category is the *supplier determined CVP perspective*, where emphasis is on the manufacturer. The manufacturer delivers value to the customer without significant collaboration from the customer side. First value is selected by the manufacturer, then provided and communicated to the customer. The second category is the *transitional CVP perspective*, which recognizes the value which is created during product use (value-in-use). The third category is the *mutually determined CVP perspective* which recognizes value creation in the all the spheres with emphasis on the *joint sphere* as described by Grönroos and Voima (2012). In this perspective the value is created across the customer relationship.

Regardless of the value dimensions definition according to Payne and Frow (2014), once the customer's value benefits are clearly understood, the company can create the bases for its competitive advantages in a chosen market. These value benefits are the building blocks of the successful customer value proposition, which is founded on an active buyer-seller relationship. Lusch (2006) concludes that establishing the reciprocal value proposal requires the customer and manufacturer to have a deep understanding of each other's goals. Payne, Frow and Eggert (2017) define the CVP as: "a strategic tool facilitating communication of an organization's ability to share resources and offers a superior value package to targeted customers".

3.3 Development of the CVP

Anderson, Narus and Rossum (2006) developed a systematic approach for CVP development. They combined best practices of a variety of manufacturers and iterated a three-way approach to CVP building. The approach starts with the selection of the suitable benefits package from *all benefits*, *favorable points of difference* and *resonating focus.* The benefits package offered to the customer is selected based on the market segment, knowledge of the customer's values, knowledge of the competitor's values and the level of dedication the manufacturer is prepared to allocate for the value proposition development.

The *All benefits* value package offering requires only some knowledge of the market offering, and no knowledge of the customer values. In this CVP type the manufacturer lists all the possible benefits their product can deliver. This is the quantity over quality approach utilized by many managers. This approach takes less effort to develop but has some apparent potential weaknesses. The best results are achieved when all the benefits are divided to points of parity (with competitors) and to points of difference. However, in this completely supplier driven approach there is a high risk of making value assumptions for the customer that are not true. This benefit assertion may in effect dilute the value creation of the genuine points of difference to the competitors.

The *Favorable points of difference* value package requires deeper knowledge of the market situation, including understanding of the key competitors' value offering. In this approach the manufacturer lists only the differentiating benefits which are elevating the product from the key competitors' products. This way the customer may be persuaded to focus on the key differentiating factors. The weakness of this approach is the lack of factual knowledge of the customer's values. Although a case may be made e.g. for superiority over some competitor product features, there is no actual awareness on which features the customer places the most value. The result of this value assumption may result in a gap between the *favorable points of difference* and the customer values.

The third alternative value package, *resonating focus,* requires customer value research, knowledge of the competitor's value offering and grasp of the critical issues in the business segment. This approach is a customer driven cooperative value delivery process where the company focuses only on a few points of difference which provide the most value to the customer. In this approach the manufacturer may even decide to purposefully provide some inferior product properties while focusing resources to the key features which provide the most value to the customer. In order to be successful in this approach the company must react to changes to the market situation and periodically update the customer value proposition to reflect the latest values of the customer.

Barness, Blake and Pinder introduced in 2009 a well structure CVP development approach they described as “Value proposition builder™”. The approach describes a six-step process for building, testing and taking a CVP into use. This process was further developed by Barness, Blake and Howard (2017) with higher focus on selling the CVP to the customer. The process begins with gathering knowledge about the market and ends in developing proof that the CVP works. Each of the six steps creates value independently, and the whole process provides a structured, rigorous and well documented path to a CVP. The process demands commitment through the company hierarchy from top management to the frontline sales manager.

The first step in the *value proposition builder* process is a detailed market analysis which zooms in from a wider industry wide perspective, down to single niche market or customer. This wider perspective develops understanding of the chosen markets cultural and political influences and risks related to the industry. In this phase the manufacturer analyzes its position in the market area and creates a strategy for the future positioning. Finally, at the end of the first step, the manufacturer chooses the customers which provide the best opportunities for profitable growth in accordance with the overall strategy and strives to see their own value delivery through the eyes of the customer.

The second step in the process is to gather actual first-hand knowledge from the customer value experience. This can only be achieved by qualitative research of the key customers. The customer interviews need to discover the value creation from a social, emotional and rational perspective. The target is to understand how the customer experiences value and capture all possible constructive criticism. A particular challenge to overcome is that the customer rarely think how they feel, say what they think or do what they say. Social science techniques such as the Interpretative phenomenological analysis (IPA) may be utilized to reach deep understanding of the value delivery from the customer point of view. It is also imperative to interview the manufacturer’s own sales team in order to find out the mismatch in the value delivery assumptions. This step uncovers the gaps between the customer value experience and what the sales team assumes to deliver.

The third step is to prepare a detailed value analysis of the manufacturer's offerings to the customers. The analysis utilizes a tool named Value Pyramid ™ developed by Barness, Blake and Pinder (2009). This tool, illustrated in Figure 5, maps products and services offered against the value they deliver to the customer. The value pyramid has four levels. At the bottom of the pyramid there is component sales, which are considered transactional selling. Here the customers know exactly what they want, and the level of sales margin and cooperation is low. The second level in the pyramid is offers. Here the manufacturer sells multiple components combined to produce a specific function. This level is still considered transactional selling as the offering is not developed to solve a specific customer need.

The third level in the pyramid is solutions. Here the manufacturer makes the jump to consultative selling where the solution provides more measurable value than the sum of its parts. On the top of the pyramid is co-created value. Here the manufacturer develops tailor made solutions for a specific customer problem or a need. The manufacturer must adjust its sales strategy and pricing according to its position in the value pyramid. The higher the manufacturer is on the value pyramid, the higher the trust and cooperation between the manufacturer and customer is. There is a huge gap between the second and third levels of the value pyramid as it requires a shift from a product centric view to a customer-oriented approach.

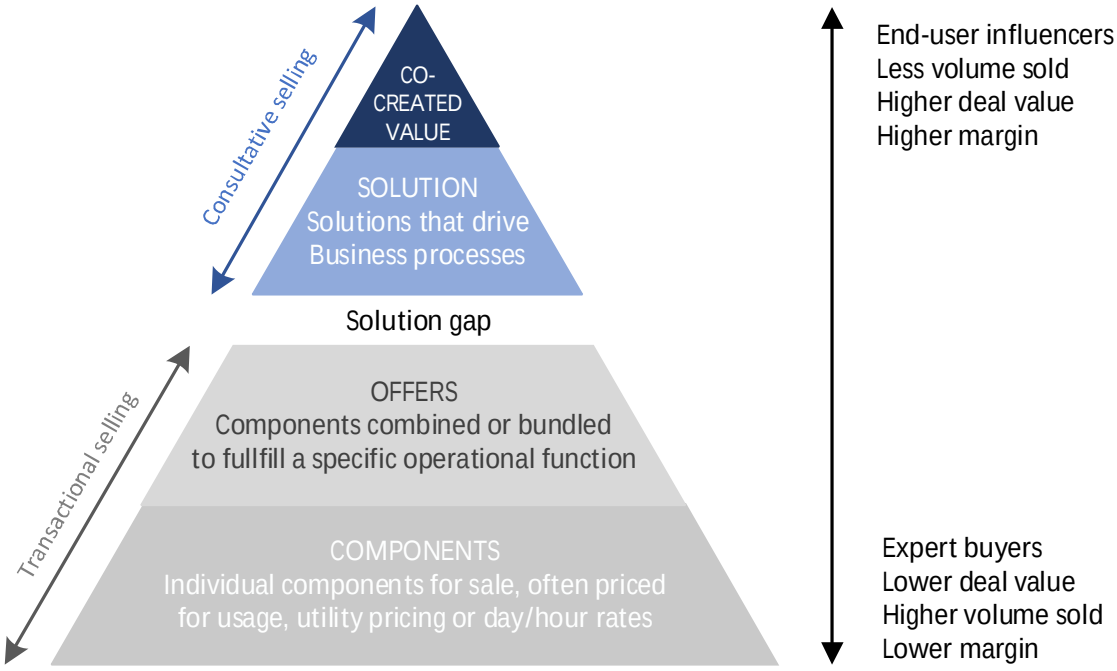

Figure 5: The value pyramid

In the product centric view, the manufacturer develops a product and then highlights the suitable features to the chosen market's customers. In the customer-oriented approach the customer is selected first and product developed to the customer needs.

The fourth step in the value proposition builder ™ is to build a value hierarchy based on the previous three steps. The manufacturer needs to refine and prioritize delivered values based on custom expectations. The pitfall in this step is the ability to let go of the values that the customer does not prioritize or perceive as critical. The value proposal must be clear, direct, short and succinct. The fifth step is analysis and comparison of the manufacturer's values to the key competitors' values. In this step the manufacturer separates the values which can be used for beneficial differentiation in the eyes of the customer. The final step in the process is to design the evidence tools that prove the success of the built CVP. These tools may include testimony from clients, fact sheet and financial elements like ROI and TCO. The step works as a foundation for powerful marketing message and justification for deeper cooperation with the customers.

Day and Moorman (2010) have a very similar process for CVP creation in their *strategy from outside in* approach. The *outside in* business strategy main focus is on perceiving all the sales actions from the customer's point of view. The strategy then defines four customer value imperatives which reinforce customer value creation and profitability in the company. First of these imperatives is to be the customer value leader with superior CVP. The second customer value imperative is to balance between the current CVP in the short term, and the continuous development of new innovative values in the long term. The third customer value imperative is to select and develop loyal customers, and then capitalize the customer as an asset be deepening, broadening and leveraging the relationship. The fourth customer value imperative is to capitalize on the company brand as an asset by leveraging it to capture new opportunities on the markets.

Day and Moorman (2010) further propose that the value leader must base the value proposition on the values which provide *resonating focus* and therefore reflect a deeper appreciation of the customers value principles. In order to achieve and maintain value leadership with superior CVP (the first of the customer value imperative) the manufacturer must follow a three-step process. The first step is to choose a market segment based on the type of value customer is expected to appreciate. The second step is choosing the manufacturers offering between components or complete solutions. The third step is to choose the differentiating values which provide competitive edge compared to key competitors.

Payne, Frow and Eggert (2017) also builds on the strengths of the previous frameworks and propose a four-step process to a CVP development. The first step is to build a value package including both benefits and costs which resonate to the customer differentiating the manufacturer clearly from the competitors. The offered resonating values should address both functional and experimental customer value elements. The second step is to consider how the offered value is created along the customer relationship. Consideration should include evaluation is the greatest value created before, during or after the usage experience. The third step is to consider the level of resource sharing in the reciprocal customer relationship. Consideration should include the possibility of co-creating the CVP. The fourth and final step is to decide which CVP design characteristic to emphasize. When the manufacturer e.g. offers co-created solutions in a B2B markets the emphasis can be on the mutually co-created CVP.

Osterwalder et al. (2014) have developed a practical, visual tool for developing a mutually co-created CVP in B2B markets. This *value proposition canvas* model relies on qualitative research which aims to understand the customer *pains* and *gains*. The target is to map out the tasks the customer is attempting to get done in day-to-day work, and what are the major obstacles (pains) and goal facilitators (gains). Tasks, pains and gains are then organized by the assumed importance. A similar process is then done also for the manufacturer sales personnel in order to find out the mismatch between offered values and expected values.

3.4 Conceptual Framework

The conceptual framework of this thesis builds on strengths of the previous concepts and combines a few of the best suited CVP framework models as depicted in Figure 6. The value proposition canvas model by Osterwalder et al. (2014) is chosen as a basis for the research workflow. In accordance with the canvas model first a combined customer profile of the key customers is created. Next, the author will create a value map of the case company and key competitors. Value maps are then compared in order to find points of parity and development needs. Finally, from the comparison of customer profile and value maps a new CVP emerges. Emphases is placed on the co-creation of the CVP in B2B market while also considering what kind of value is created at the different stages of the customer relationship.

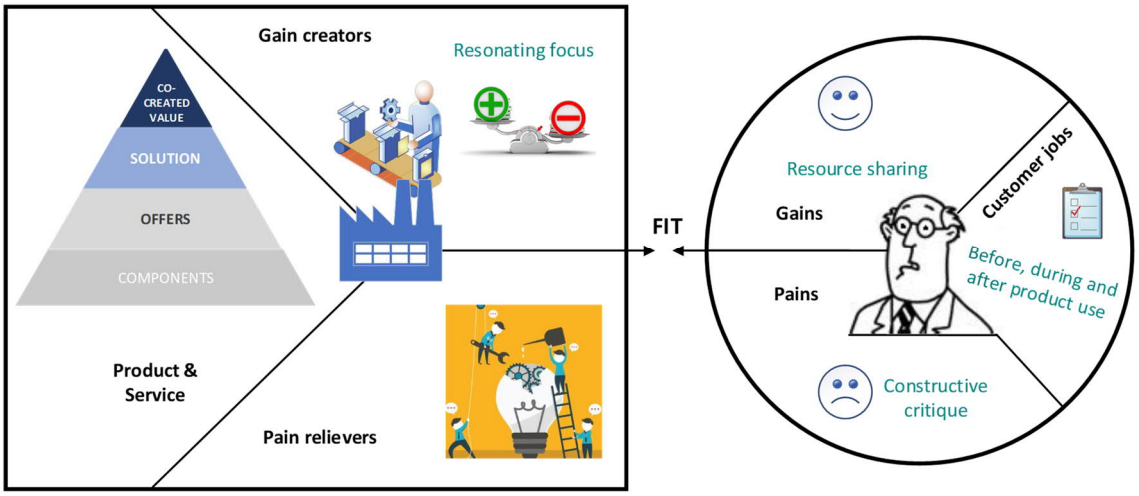

Figure 6: Conceptual framework

The canvas model items are prioritized based on the other scholarly CVP models chosen. Products and services of the case company are valuated based on the Value pyramid by Barness, Blake and Pinder (2009). Case company gain creators which are considered to provide resonating focus with the key competitors are prioritized, while points of parity with the competitors are largely omitted. Opportunities for resource sharing and value creation throughout the business relationship are seized upon in accordance with the theory by Payne, Frow and Eggert (2017).

3.4.1 Customer Profile

First element of the CVP is the customer profile. In accordance with the canvas model the customer profile includes three segments gains, pains and customer jobs, which are deduced by the means of qualitative research from selected key customers. Pains and gains are then organized in priority order. Gains represent the functional utility, social gains, positive emotions and cost savings that the customer wants to achieve.

Pains represent all the obstacles which hinder the customer ability achieve the optimal outcome. Pains include also all the undesired potential outcomes which are seen as risks by the customer, as well as all the undesired product features. Customer jobs are the social, functional and supporting tasks which the customer attempts to get done in day to day work. Important is to capture the customers perspective of what they are trying to get done. In addition to the canvas model, focus is directed to the resource sharing and value creation throughout the customer relationship as described by Payne, Frow and Eggert (2017). All the customer constructive criticism is noted as per Barness, Blake and Pinder introduced (2009) as pains. Gains, and pains which provide opportunity for cooperation and resource sharing are considered higher priority elements. Product features where the customer provides direct constructive criticism are similarly considered as extreme pains and are higher priority elements.

3.4.2 Case Company Value Map

Second element of the CVP is the case company value map. In accordance with the canvas model the case company value map includes three segments gain creators, pain relievers and products & services, which are deduced by the means of qualitative research from case company sales department. Pain relivers and gain creators are then organized in priority order. Gain creators describe how the case company product & services create value for the customer. They explicitly describe how the case company creates outcomes and benefits which the customer expects and is positively surprised by. Pain relievers describe how the case company's products & services alleviate some of the specified customer pains. The proposition focuses on few of the high priority pains reduction or removal. Product & services is a comprehensive list of the substance which the case company offers to the key customers.

In addition to the canvas model, products and services provided by the case company are evaluated with the Value Pyramid tool developed by Barness, Blake and Pinder (2009). Products and services which are higher on the Value Pyramid are considered essential goods to be provided to the key customers and possess therefore higher priority in the evaluation. These goods are co-created solutions to specific customer needs which provide higher customer loyalty and better overall margin. Gain creator which can be considered to have resonating focus with the customer as described by Anderson, Narus and Rossum (2006) are essential assets and therefore have higher priority in the evaluation. Similar value map is constructed from the case company key competitors with the information publicly available.

3.4.3 Value Map FIT to Customer Profile

In this third and final element of the CVP the value maps of key competitors and the case company are first compared, and points of difference are noted. Next, the case company value map is compared to the customer profile. All the products and services which answer to customer jobs are marked. Customer pains are compared against the pain relievers and customer gains against gain creators. Next, the value map fit to the customer profile is evaluated based on which parts of the customer profile are not addressed by the case company value map. High priority elements, which are not addressed by the case company value map, are the building blocks of the new enhanced CVP. Most critical points are the missing high priority elements, that are provided by the key competitors.

Critical points are evaluated together with management and engineering teams of the case company. From the ideas developed with the case company teams a new value map of the case company is created and compared to the customer profile. The result of the final iteration of the case company value map is the new enhanced case company CVP. The next section starts the journey towards the new enhanced CVP with the creation of the current state analysis of the case company's customer value position canvas in accordance with the conceptual framework described in this section.

4 CVP Current State Analysis

This section discusses the current value delivery process of the case company by comparing the company's current CVP to the key customer value profile and to the main competitors' offering. The section starts with a short overview of the methods used to map out the current state of the case company customer value proposition. This is followed by the research of key customer value dimensions, structured according to the chosen framework. The next subsection examines the case company sales team in order to quantify the current customer value proposition. The following subsection deconstructs the main competitors' CVP and presents it in the same format as the case company's CVP. Finally, in the last subsection the results of the previous subchapters are compared in order to validate how the company value maps fit to the customer value profile. The initial raw data gathered from the informant interviews was processed according to Figure 7 below.

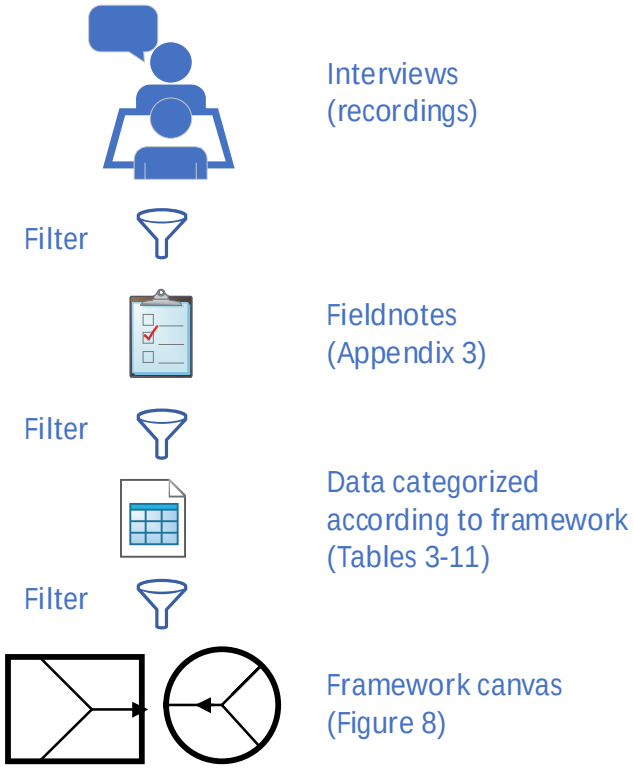

Figure 7: Current state analysis data processing

Some of the interviews were recorded and fieldnote summary written up at a later time. After the finalization of the field notes all interview recordings were deleted in order to protect the anonymity of the informants. Data in the field notes was categorized to pains, gains, customer jobs, pain relievers, gain creators, products and services according to the framework and presented in Tables 3-11. For data traceability the informant pseudonym was included in the first column of the tables. Finally, the data selected according to the framework criteria is presented in the Figure 8.

4.1 Overview of the Current State Analysis Stage

The current state analysis of the CVP was conducted in four distinct steps. The first three steps gather data from different disciplines, and the fourth final step compares and analyzes the gathered data. The first step in the current state analysis was to study how the customer perceives the tasks related to the ship building. This analysis was focused on the tasks related to contract negotiations, equipment acquiring, testing, commissioning and finally the operation of the case company equipment. The focus was chosen in order to capture the value creation throughout the customer relationship.

In the contract negation phase, the case company acts as value facilitator as the solutions are offered according to the customer quotation request. In the equipment acquiring, testing and commissioning phase the value is co-created with the customer through direct communication. Product features and integration is customized in cooperation with the customer. Throughout the commissioning phase the customer gains the first supervised user experiences from the equipment and the value judgement is developed accordingly. Finally, once the customers are independently operating the delivered equipment, they are creating value judgements based upon every user experience.

Research also aimed to uncover possibilities for resource sharing and critical goals the customer has along the customer relationship. These findings provide opportunities for a consultative sales approach that offers solutions co-created with the customer. Finally, the research targets to discover the critical obstacles the customer faces in different stages of the relationship. All constructive criticism of the current way of working is noted, and all the customer difficulties that are not considered at the moment are evaluated. Most of the research data from the customers was gathered through semi-structured face to face interviews. A question list (Appendix 1) was sent to the customers a few days before the agreed interview time in order to create a cooperative, friendly atmosphere. The interviews didn't strictly follow the question list, as it merely worked

as a guide for the topics to be covered. The informants were given the freedom to express all their opinions. The interviews were recorded and transcribed. Summary of the interview field notes and they can be found in appendix 3.

The second step in the current state analysis was producing the case company value map. The value map represents the total value the case company sales department reflects to the customers. The products and services offered were divided into different layers of the Value pyramid in order to see areas where the offering could be developed to a more solution-oriented direction. In addition, the value pyramid separated the solutions which are already developed in cooperation with the customer. The value map was constructed by semi-structured face-to-face interviews with the case company sales team members. The informants included both commercial bid managers and technical sales support engineers. Together they provided a complete picture of the marketing strategy and technical focus areas utilized in the sales efforts. In addition, the case company sales numbers were analyzed in order to see exactly how much improvement can be theoretically achieved. All interviews were recorded and transcribed. Summary of the field notes can be found in appendix 3.

The third step in the current state analysis was the deconstruction of the main competitors' CVP. Three main competitors were identified based on the interviews with the case company sales management. Publicly available sales material from the top three key competitors were analyzed in order to deconstruct their value offerings. The target of this step was to identify areas where the competitors are successful value facilitators. The potential value created by the competitors may be captured by the customers, if the values which provide resonating focus are not matched or surpassed by the case company. The materials used in the main competitor analysis are detailed in Table 2.

The fourth and final step of the current state analysis was the analysis of the customer value map fit to the case company value profile. This analysis revealed the strength and weaknesses of the current CVP. The comparison was done to the case company values as well as to the competitor values in order to also gain insight to the case company's relative market position. The strengths revealed by analyzing the key competitors were treated as potential threats to the case company's market leader position. The analysis was done according to the chosen conceptual framework.

4.2 Customer Profile

The customer profile was created based on face to face interviews of four tier 1 customers and one phone interview of a significant tier 2 customer. The tier 1 customers interviewed represent three different shipyards with strong business relations with the case company. The tier 2 customer interviewed for this section represents one of the world largest cruise line companies and is consider as one of the most important customers of the case company. Some of the informants have requested to be noted as contributors for this thesis and are therefore named. Mr. Lucio Vallerga the technical project manager of T. Mariotti Shipyard is here after referred to as the Customer representative 1.

Other informants have been anonymized as agreed in the interview meetings. The information gathered from the interviews is summarized in tables 3-5 below, which presents the information in two columns. The first column indicates informant whom provided the information. The second column provides the selected data extracted from the interview field notes, attached in appendix 3. Only data critical to the framework is presented in the below tables. Table 3 below lists all the pains described by the informants.

Table 3: Summary of customer pains

Customer	Customer pains
3&4&5	Missing information about new available solutions during pre-contract
3&4&5	Differences in product families are not highlighted to the customers satisfaction.
2&3&4&5	Difficulties in comparing of the bids when the monetary value of integration benefits and new features are not shown.
1&2&5	The limit of delivery scope (and related options) is not clearly enough represented in the specifications.
4&5	Benefits of the new product features are unclear. Functional and (calculated) monetary price justifications are missing.
5	Insufficient ABB network resilience (MOXA Ethernet switch failures) although significant advances are already made.
1&2	Preliminary dimensions of the main equipment enlarge after GA creation
1&3	Insufficient availability of the proper binding and correct documentation with minimum deviations from the supplier in time.

5	Offered non-ABB brand products (transformers) are not subject to enough ABB technical scrutiny.
1&2	System functionality can't be commented as the upper level principle diagrams are missing.
3	Mistakes in the external cabling drawings cause double work for the shipyard.
5	The lack of skilled manpower in application engineering.
1	Document deliveries are not well structured. There are too many documents and the owner approval documents are not clearly marked.
5	Relevant interlocks and guides are to ensure the safe operation of the complex systems throughout the lifetime of the vessel.
5	Internal friction between ABB business units causes technical issues (lack of technical coordination).
5	ABB's poor control of software versions and parameters. Significant time has been lost on SAT.

From the interview results presented in Table 3 it can be clearly seen that certain themes begin to repeat in the informants' answers. The following paragraphs go through the key findings in a chronological order, as they appear in the customer relationship. Customer representatives 3,4 and 5 described the arrogant way in which the case company adds new features to the products without clearly specifying the added value to the customer. This issue has been noted to some extent by the case company and customer representative 5 was already pleased with the corrective actions taken. Some critique was also directed to the new network communication system design. The customer representative 5 voiced some concerns regarding the control system resilience as the ship networks are getting more complicated and the number of ethernet switches and routers increase. However, the customer admitted that also here good progress has already been made (especially by the case company) as network redundancy has been improved. Informants 2-5 additionally noted that the product price is one of the most important factors in the contract negotiation phase and the comparison of the bids is made difficult when the monetary value of integration benefits and new features is not shown.

In the project development phase multiple informants highlighted the importance of respecting the preliminary data provided in the contract negotiation phase as this is the basis of the shipyard vessel design. The supplier should also make every effort to respect the ship specification with minimum deviations, as all of these details have been already agreed between the vessel owner and vessel builder. The issue raised by the customer has good merit as “the deviations of convenience” cause the shipyard a great deal of extra working hours while opening again negotiations between the ship owner and ship builder. Customer representative 5 insisted that the case company should more strictly audit and supervise the sub-suppliers although the contract usually leaves the case company freedom to select the equipment manufacturing factory. This customer pain was triggered by the case company’s decision to sell the Power grid division of the group.

In the plan approval phase customer representatives 1 and 2 would prefer to see upper level principle diagrams detailing the philosophy of the case company systems communication. The principle diagrams would provide the customer an easier medium to comment the system integration and co-create solutions which are mutually beneficial. Principle diagrams would also mitigate to the customer representative 1 concerns of the document management as the system functionality would be easier to comment without investigating multiple detailed circuit diagrams. Some criticism was also given by customer representative 3 about the quality of the case company system integration drawings which have caused the shipyard extra work and losses in goods.

Finally, customer representative 5 provided insight on issues related to case company internal communication and resource development. It has been noted that the software development is not well managed and critical work processes are missing. Many of these issues are seen in the sea trial which is the worst possible time to have delays. As there is no internal process e.g. when to configure ethernet switches the work is done differently in different vessels. Software parameters and software version handling is not well structured. The same problems are solved differently in different vessels and software versions are not comparable.

This concludes all the customer pains derived from the customer informant interviews. Next, table 4 below lists all the gains described by the case company customer informants.

Table 4: Summary of customer gains

Customer	Customer gains
5	ABB have managed to maintain competitiveness, while maintaining a high quality and comprehensive product range. The owner is extremely satisfied with the quality Vs Price of ABB brand products.
2	Equipment is modified to fit in a yacht or a small cruise ships with special space restrictions.
3	Equipment supplier is chosen based on the total cost to the shipyard, fluent co-operation, reliability.
1&3&4	Less system integration work left to the shipyard as the supplier provides an actual “turnkey” solution (with supplier integration responsibility)
1&2&4	Less contact persons, less subcontractors and higher level of integration.
1&3&4	Further integration of aux. motor starters and main equipment protection into a more self-sustained solution
1&2&3&4	Equipment dimensions, service area, cooling data, power consumption and weight are frozen two months after contract signing.
1	Efficient and rapid reply to customer inquiries (noted that the case company has performed well)
2	Main equipment on-time delivery as the late delivery may jeopardize the entire ship building schedule.
3&4	Commissioning manning should be ramped: pre-commissioning check, closing of FAT remarks, cold commissioning, hot commissioning
1&2&3&4	Clear HAT and SAT test procedures and testing execution (noted that professionally done by the case company)

The principal theme that rises from the interview results depicted in Table 4 was the benefits that the customer perceives from the large turnkey deliveries with a single contact person for all communications. The shipyard wants to be unburdened from the integration responsibility of clearly defined systems. Additional benefits were seen in

the solutions which also include the control and protective functions embedded to the system. Customer representatives 1, 3 and 4 noted also that they would prefer that the case company takes ownership of the auxiliary motor starters related to their products. All the shipyards (tier 1 customers) highlighted the value created when the supplier manages to devote additional resources for the two months following contract signing. During this basic engineering phase, the supplier needs to provide the shipyard the project specific equipment dimensions, service areas, cooling data, power consumptions and weights.

Customer representative 5 emphasized that high quality and a comprehensive product range are some of the key success drivers of the case company. The customer trusts on proven track record in reliability of the equipment. Although some critique was given on a specific major technical problem, the customer was extremely satisfied that sufficient resources were dedicated to solving the problem and the problem was faced with a manner which reflects integrity and transparency. Customer representative 2 summarized that the reliability of the supplier is one of the most critical factors. First the supplier must have the resources to deliver the equipment on time even if there are unforeseen circumstances. Secondly the supplier must have the “financial muscles” to deal with setbacks and honor the commitments stated in the signed contract. The ability to customize the products according to challenging space constrictions (on a smaller vessels) has been a deal breaker in many contracts.

Customer representative 1 praised the case company on its ability to response to critical technical questions with due haste. The customer has seen this as one of the key success factors on the project development phase. Finally, the equipment test program carried out on board the vessel is seen well-structured by the customer representatives 1,2,3 and 4. Although some additional value may be created before the final testing, during the commissioning of the equipment on board the vessel. Customer representatives 3 and 4 see a strategic benefit in “ramping” the start of the equipment commissioning. The informant clarified that first only one engineer from the supplier is required to check the readiness of the vessel. Next, one more engineer is required to close the remarks given to the equipment. Next, the specialist for the cold commissioning of the specific equipment arrives to the vessel. Finally, after the shipyard work has progressed and main power is available the rest of the commissioning team arrive to the vessel as needed. The customer considers this approach to save working hours on both sides as the work process is better organized.

This concludes all the customer gains derived from the customer informant interviews. Next, table 5 below lists all the customer jobs described by the case company customer informants.

Table 5: Summary of customer jobs

Customer	Customer jobs
1	Estimation of ship cooling system and electric consumption for load balance calculation pre-contract.
1	Sizing of the main engines based on load balance calculation derived from consumption estimations.
1&2	Preparations of the vessel general arrangement design with the positions of the main equipment.
5	Pre-contract negotiations between supplier – builder – owner with the purpose of avoiding any punitive 'design change cost' by the supplier.
1	Technical specification finalization between the ship owner and shipyard.
1	Contract signing with the subcontractors and finalization of the technical requirements of the equipment.
3&4	After contract agreements on yard interfaces on face-to-face meetings with the suppliers
3&4	Negotiations/ agreements of the detailed engineering of the equipment with the suppliers.
1	Integration of all the different systems not delivered by the same supplier.
1	Critical project development work (80% of the total work) in cooperation with the suppliers done within the first 3 months after the contract signing.
3	Collecting all certificates, declarations, final documents and closed remarks after sea trial

According to the data gathered from the informants most of the critical customer jobs are performed in the very early stages of the project. These customer jobs many times rely on preliminary pre-contract indications from the suppliers and knowledge that comes with experience on the ship building sector. The customers highlighted the importance of accurate preliminary equipment information. Much of the later detailed engineering is built on top of these preliminary estimations and past experiences. In order to obtain the most accurate preliminary data the customer representative 5 has already

initiated some actions in the form of pre-contract design negotiations between the ship owner, ship builder and equipment supplier. These actions aim to bridge the gab between the vessel owner and the equipment supplier.

Customer representative 1 described in detail the shipyard (tier 1 customer) tasks in different stages of the ship building, starting from the basic design. In basic design the ship dimensions, purpose and general characteristics are locked. Preliminary load balance calculations of the overall electric consumption are made according to the best available information in the pre-contract phase. Next, the main engines and generators are dimensioned according to the load balance calculations and the first draft of the General arrangement is prepared. After the first preliminary GA is drafted the shipyard finalizes the vessel specification with the ship owner (tier 2 customer).

Once there is an agreement between the ship builder and the ship owner contracts are signed between the equipment suppliers and details of the supplier specifications are agreed. Customer representatives 3 and 4 further clarified that in this step the interfaces between the equipment supplier and the shipyard are agreed upon. Customer representative 1 emphasizes that this project development phase includes 80% of the work in a very short period of time. All the systems which are not delivered by the same supplier must be integrated to control, indication and alarm systems by the shipyard. Power supplies and critical system redundancies must be designed. Finally, customer representative 3 underlined the importance of the last tasks before ship delivery. All the final documentation with implemented red pen corrections must be delivered to the customer. All certificates and declarations required by the shipowner, classification society and flag state authority must also be delivered before the ship delivery can be concluded.

4.3 Case Company Value Map

The case company sales numbers reflect that hundreds of projects are quoted steadily every year. From these projects only around 5-7% lead up to a contract. Although the circumstances of each of the quoted project are different, there are definitely possibilities for improvements. The case company value map was created based on phone interviews of four case company sales team representatives. Two of the informants represent the technical sales support department and provided insight to the product offering. The two other informants represent the commercial sales department. All case company informants have full anonymity and are denoted only by their generic job title. The information gathered from the interviews is summarized in Tables 6-8 below, which

presents the information in two columns. The first column indicates informant whom provided the information. The second column provides the selected data extracted from the interview field notes, found in appendix 3. Only data critical to the framework is presented in the below tables. Table 6 below lists all the pain relievers described by the informants working in the case company.

Table 6: Case company pain relievers

Informant	Case company pain relievers
Sales manager 1&2	Global service & maintenance network together with the data gathered online via remote diagnostic system provides operation certainty in case of system failures
Sales manager 1	Detailed technical support for crew is provided in case of operational problems.
Sales manager 1	Less equipment footprint as ABB solutions have a common alarm and events system
Sales manager 1	All sub-systems provided by ABB are under the same 24/7 support during the warranty and over lifetime
Sales manager 1	ABB solutions guarantee the proper operation of the Azipods™
Sales manager 2	ABB is a credible partner in new low/zero emission technology as green values are in the core of the ABB brand.
Sales manager 1	ROI calculations based on Azipod fuel efficiency and powerplant optimization to justify equipment selection
Tech. sales support 2	ABB has the financial packing and engineering resources to handle challenging projects even if there are unforeseen technical problems
Tech. sales support 1	Presentation of new features and consultation on new technology to consulting companies and vessel owners
Tech. sales support 2	All ABB systems are connected together via redundant, single failure resistant, control network in order to enhance system reliability.

The key pain relievers identified in the interviews were the benefits that come from working with a well-established global company with reliable solutions and well-structured services. As seen in Table 6 according to the sales manager representatives 1 and 2 the case company has made a well-placed strategic decision to provide the

remote diagnostic system for the customers with little or no-cost. The provided system enhances the case company long term maintenance and support services. The diagnostic system has a modular structure which can be upgraded to include a wide variety of case company solutions. All devices under the remote diagnostics monitoring are less likely to cause operational losses as maintenance can be planned according to the actual condition of the equipment. In case of machine failure correct resources with correct parts and tools can be sent to the vessel faster to remedy the situation.

Sales manager representative 1 noted that all case company systems are connected to a redundant optical control network. This provides the vessel space and economic savings. Less monitors are needed as the data from different systems can be accessed through the integrated network. The informant additionally stated that once the complex Azipod propulsion solution is sold, a case can be made to ease the customer worries of the Azipod integration by providing an additional system that provide superior overall vessel performance with the Azipod. Technical sales support representative 2 added that the case company has taken in to use a single-point-of-contact operational model where there is always just one phone number to call if there is a problem with any of the case company equipment at any point of the ships life cycle. This provides maximum efficiency to the communication and helps the customer to see only one company behind the ABB brand.

Finally, the sales manager representative 2 and technical sales support representative 2 summarize that the case company have credible resources to prevail in complex projects even if there are unforeseen technical problems. This enhances the case company's position, when quoting novel zero emission technology, as the customer can be assured that the new solution will be made operational. Many of the smaller companies entering the marine sector cannot convince the customer that they have the financial and technical fortitude to successfully manage the project to conclusion. The case company brand is placing a strong emphasis on digitalization, efficiency and green values.

This concludes all the pain relievers derived from the case company informant interviews. Next, table 7 below lists all the gain creators described by the case company informants.

Table 7: Case company gain creators

Informant	Case company gain creators
Tech. sales support 1	Technical support enhanced by the remote satellite connection to the ABB systems via Remote diagnostic Unit
Tech. sales support 2	ABB utilizes a state-of-the-art vessel simulator to map out different ship operational conditions and prepares studies of the fuel savings and ROI calculations
Sales manager 1	Operational (time and fuel) savings are demonstrated with diagnostic data combined with vessel operation simulators
Sales manager 1	ABB as system integrator brings knowhow to complete a complex project and the fortitude to take ownership of the turnkey technical executions
Sales manager 1	Diesel-electric powerplant is dimensioned to run constantly on the optimum operational area creating higher fuel efficiency and operational savings.
Sales manager 1	Preferred solution supplier by many vessel owners as products are proven reliable by many reference deliveries and millions of operating hours.
Sales manager 2	ABB Marine consults and provides the solution which is the best overall fit for the vessel type and design in order to provide suitable maneuverability, performance and efficiency
Tech. sales support 2	Single point of contact from ABB throughout the lifetime of the vessel in order to simplify communication and provide rapid support

Most of the gains described by the case company informants in Table 7 provide benefits for tier 2 customers (vessel owners). This fact was also noted by the informants and therefore the case company aims to influence the vessel design before the project comes to tier 1 customers (shipyards). The case company has cultivated good relations with consulting companies and vessel owners who form the first design decisions on the vessel equipment characteristics. Most of the informants describe the many studies and simulations done for tier 2 customer in order to provide proof of operational savings by superior maneuverability and fuel efficiency. In some cases, the tier 2 customer has invited the case company already in the pre-contract phase to the technical negotiations together with the shipyard. Sales manager representative 1 highlighted that the

shipyard gains from their fast engineering resources and can be reassured that the complex system integration work is performed to the satisfaction of all parties. This concludes all the gain creators derived from the case company informant interviews. Next, Table 8 below lists all the product and services described by the case company informants.

Table 8: Case company products and services

Informant	Case company products & services
Tech. sales support 1	New products are marketed and presented directly to vessel owner and their consultants (tier 2 customers).
Tech. sales support 1	Zero emission technology like batteries and fuel cells
Tech. sales support 1&2	Remote diagnostic system is given for free. Licenses for one year.
Tech. sales support 1	Propulsion solution with drives and Azipod.
Tech. sales support 1	Power distribution solution with Main Switchboard and transformers
Tech. sales support 1	Power plant solution with Generators, Neutral point resistors and AVR's
Sales manager 1	Propulsion Control Unit
Sales manager 2	Remote control system
Sales manager 2	Three-way negotiations pre-contract between ABB, shipyard and vessel owner in order clarify the vessel technical specification between all parties
Sales manager 1	New product and features presentations for the vessel owner.

Many of the informants described how the case company always strives to provide the customer with a custom-built electrical solution which is the perfect fit to the specific vessel while considering the actual operational profile of the vessel. As depicted in Table 8 above the case company provides powerplant, power distribution, propulsion and

remote-control systems. Sales Manager representative 1 described the case company scope of supply as “everything from bridge to propeller”. The level of integration on the systems varies a lot. Sales Manager representative 2 noted that for example distribution transformers (that are part of the power distribution) are not integrated to other case company equipment. As there is no control or alarm system tying the transformers to the power distribution solution the customer can easily shop for cheaper equipment.

As described by the technical sales support representative 1 the new zero emission technology is presented and directly to the vessel owners and their consultants in order to add awareness of the available solutions. The informant then continues to describe how this technology is then quoted to the shipyards when the vessel owner has specified the case company technology in the vessel specification. The sales manager representative 2 describes that the case company solutions have been co-created with the large shipyards at the beginning of the vessel series. He sees no need to justify the quoted solution separately for each contract, although there is increasing pressure to quantify the integration benefits to the shipyard as most of the product integration benefits are seen to be directed to the vessel owner.

4.4 Key Competitor Value Map

Based on the case company sales department interviews GE (General Electric), Siemens and Wärtsilä were identified as the main competitors of the case company. These top three competitors have a global reach on the marine service sector, comprehensive product range, vast engineering resources and the required notoriety in the marine sector. The revenues of all the top competitors are measured in billions of euros. In this chapter the competitor value map is deconstructed based on seven sales brochures of the main competitors. The sales brochures were analyzed to find the pain relievers, gain creators and the products & services the competitors are marketing to the customers. The results of this analysis can be seen in tables 9-11 below. The focus of the analysis was to discover the points of difference to the case company.

Table 9 below lists all the competitor pain relievers deconstructed from the publicly available marketing materials.

Table 9: Competitor pain relievers

Competitor	Competitor pain relievers
GE Wärtsilä	Expanded global service network for customer issues
GE	Fast technical support for global cruise customers
Siemens	Technical support and consultation throughout the life cycle of the vessel from the ship building, to service and modernization.
GE Wärtsilä	Reduction of unplanned downtime with analytic maintenance software
GE Siemens	Automatic solutions which address the skill concerns of the vessel labor force (innovative automation systems to help the crew tackle complex technical processes).
GE	Fuel efficient electric solutions to support the customer profit margin in the cruise sector
GE, Siemens, Wärtsilä	Technology which helps to fulfill the strict environmental regulations

All the main competitors follow the three mega trends in the Marine industry: digitalization, green values and electrification. As seen in Table 9, GE and Wärtsilä advertise their digital services in the form of analytic maintenance services which can be remotely monitored from a supplier support centre. Technical support centers provide the customers with 24/7 support and access to service engineers. All the main competitors are also providing new innovative solutions which promise to reduce the carbon footprint of the vessel and support the customer in fulfilling the ever-increasing environmental regulations. GE and Siemens have delicately tackled the issue of crew skill level by marketing automated processes to handle some of the complex processes. This issue has also been raised by some shipyards as a matter of safety as there are many helping hands on board with minimum education. Finally, GE emphasizes their massive resources and rapid response time and Siemens highlights their position as a consultative partner throughout the vessel life expectancy.

This concludes the pain relievers deconstructed from the competitor marketing materials. Next, Table 10 below lists all the competitor gain creators deconstructed from the marketing materials.

Table 10: Competitor gain creators

Competitor	Competitor gain creators
GE,Siemens Wärtsilä	Cleaner fuels. Solutions to minimize or eliminate emission
GE	Electric solutions which may be positioned flexible to the vessel GA to save space e.g. for additional cabins
Siemens	Space and load saving innovations
GE, Siemens	Fuel efficiency optimization
GE	Greater collaboration between operator, technology experts, ship builders, designers and owners to accelerate new innovations
Siemens, Wärtsilä	Seamless integration into dedicated system
Siemens	Integrated overall solutions which are not restricted to optimizing a single function, but rather aim at the entire process.
Siemens	Market-leading energy efficiency of drive systems and generators
Siemens	Experience in marine systems and design integration ensures reduced operating costs and increased ship reliability and availability.
Siemens	Integrated, modular and scalable power distribution solutions
Wärtsilä	Monetary value calculations to justify higher product price when a single supplier is chosen to integrate a complete solution.
Wärtsilä	A single point of contact and single responsibility
Wärtsilä	Single supplier integration provides: Reduced risk of incompatibilities, faster decision making, fewer coordination difficulties, co-engineering with shipyard design department, on-site support during installation and commissioning
Wärtsilä	Reduced operating cost through efficient product integration
Wärtsilä	Monitoring and auxiliary control integrated in the touchscreen displays

As seen in Table 10 Siemens and Wärtsilä promote themselves as superior system integrators and GE sticks to the industry mega trends and specific product benefits. Siemens leverages their market leader position in some of the technical solutions and huge product range, to offer the customer optimized processes rather than just an optimized individual product. Siemens market their product ranges as modular, scalable and customizable. Wärtsilä is the only competitor who provides estimations for the money saved when choosing them as the single supplier and system integrator. In addition, Wärtsilä lists many of the benefits related to outsourcing the integration responsibilities. Finally, Wärtsilä provides some tangible examples of their seamless integration e.g. the integrated local control of auxiliary devices. This concludes the gain creators deconstructed from the competitor marketing materials. Next, Table 11 below lists all the competitor products and services deconstructed from the marketing materials.

Table 11: Competitor products & services

Competitor	Competitor products & services
GE, Siemens	Zero emission power plant solutions (e.g. fuel cells)
Wärtsilä	Plug&in battery hybrid solutions
Wärtsilä	LNG Gas hybrid solutions
GE	Advice on system updates and technology insertion options
GE Wärtsilä	Condition monitoring services and predictive maintenance systems
GE	Integrated electric power and propulsion solution
Siemens	HTS Generators (High temperature superconductivity)
Siemens	SISHIP SiPOD podded electric propulsion system. SISHIP SiPOD podded drives offer maximum maneuverability, speed, and reliability
Siemens	Coordination of all electrical equipment as general contractor to minimize interface problems
Siemens	Help to find the right financing solution
Siemens	Turnkey models and designs precisely tailored to specific requirements
Siemens	Installation of all cables and equipment into the vessel

Siemens	High integration automation solutions that allow access to all relevant data on the ship from a single location.
Wärtsilä	High voltage shore connection systems
Wärtsilä	Multi-functional operator stations (NACOS Platinum system) combines the control systems for navigation, automation, dynamic positioning, power and propulsion into a single integrated system.

All of the competitors market aggressively their new zero emission solutions varying from battery hybrid to LNG and fuel cell solutions. All the competitors also market their own power distribution solutions and full system integration. Siemens additionally widely markets their own podded propulsion solution the SiPOD as part of their SISHIP marine solution. Siemens provides the largest level of equipment integration and services covering many aspects that others are not providing. Siemens goes as far as providing support for the customer financial solutions and providing general contractor services. Both Wärtsilä and Siemens market a high integration automation system which provided access to multiple (traditionally independent) systems from a single operator station.

4.5 Value Map FIT to Customer Profile

In this chapter the data is prioritized and presented according to the conceptual framework detailed in chapter 0. Figure 8 below illustrates the case company value map fit to the customer profile. All items in the figure are derived from tables 3-11 above. Yellow labels in Figure 8 represent the points of parity with the competitors and are therefore not considered as strengths or weaknesses. Green label items are considered as high priority strengths of the case company. These items were highlighted by the customer informants and additionally noted by the case company informants. Red label items are high priority items pointed out by the customer informants which are not currently dealt with by the case company.

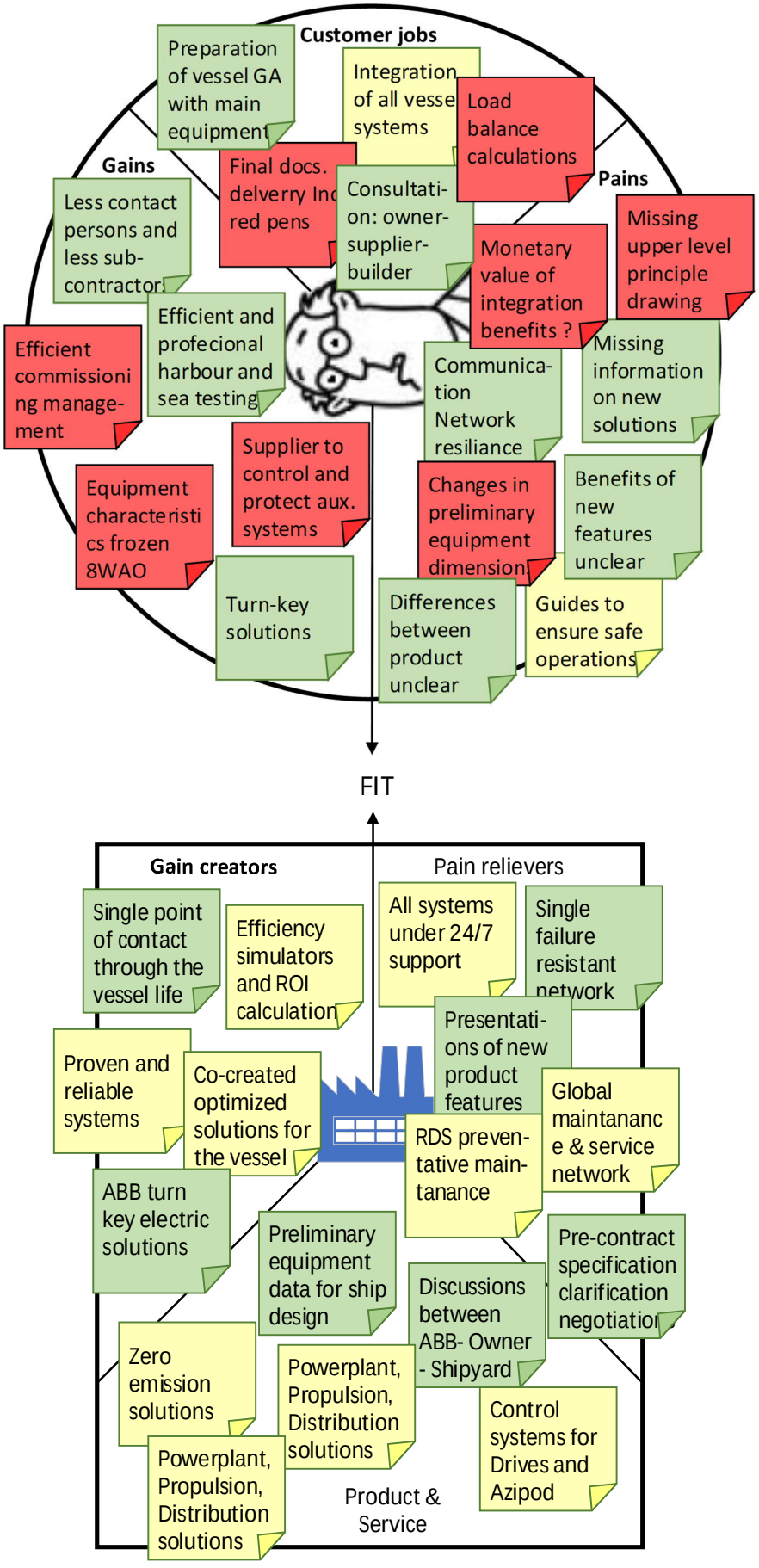

Figure 8: Value map fit to the customer profile

4.5.1 Strengths

Seven high priority strengths depicted in Figure 8 were identified while triangulating the data from the case company sales managers, case company technical support engineers and customer interviews. The gain creator strengths were independently highlighted by three different shipyards (tier 1 customers). Therefore, the delivery of the case company turnkey electric solution was identified to have resonating focus with the customers as long as the scope of the solutions is correctly structured. The informants emphasize that the preferred turn-key solution should be as self-contained as possible. Control and protection functions are to be, as much as possible included and not reliant on the external vessel (automation) systems.

The case company modular communication network onboard the vessel is a strong value creator as it creates the foundation for other integration benefits noted by the customers. The redundant network may be utilized to reduce system footprint onboard as multiple systems can be operated from a single operator screen connected to the network. Additionally, the customer work is reduced as there are fewer external interfaces, less hardwired I/O signals and less cables to be pulled. Finally, the preparatory detailed engineering work done by the case company pre-contract has provided value for both tier 1 and tier 2 customers. Less time is spent after contract signing evaluating the correct product features to be included and services to be provided. Some critique to the solution selection process was voiced by the interviewed tier 2 customer, but as the case company has already taken immediate corrective steps the issue has been turned to a strength.

4.5.2 Weaknesses

Eight high priority weaknesses depicted in Figure 8 were identified while triangulating the data from competitors, customers and case company. Some of the prioritized weaknesses e.g. the *lack of monetary value statement of integration benefits* was highlighted by the customer and offered by the competitors, but not supplied by the case company. Some of the prioritized weaknesses were concluded to be the root cause of many of the other pains of the customer. The *missing upper level principle drawings* issue raised up by two shipyards independently can be seen as the contributor to the issue of *document management and quantity*. As there are no upper level principle drawings of the solutions offered by the case company the customer is forced to analyze a large quantity of detailed wiring diagrams and functionality descriptions of the individual equipment in order to comment the solution functionality. This increases the customer frustration and burns away precisions time at the early project development phase.

While working on the case company the author knew that the efficient use of commissioning resources was already raised as one of the key development initiatives by the case company management. As the customers see the efficient commissioning management as one of the critical project success factors this opens a valuable opportunity for value co-creation in the commissioning process improvement. The customer gain related to the *supplier control of auxiliary systems* presents an opportunity to elevate some of the case company products in the Value Pyramid ™ depicted in Figure 5. This apparent weakness (at the moment) could be turned in to a source of value with the proper development actions. Many of the other prioritized weaknesses depicted in the Figure 8, were voiced by the customers as direct critique to the case company over the length of the customer relationship in the project execution.

The identified strengths and weaknesses of the current CVP are further analyzed in the following chapter 5 by the case company Electric solution department lead engineers and managers. The decision on which weaknesses to focus is done based on the analysis performed in the work group meeting (Data 2).

5 Development of the new CVP

This section builds upon the outcome of the previous section. The identified critical strengths and weaknesses are discussed in a work group filled with management and project execution expertise. This section first provides an overview of the research techniques used in the CVP development process and provides justifications for the informant selection. It then describes the actions and changes required in order to develop the new elements to the CVP. These tangible action points are included to provide additional credibility to the first CVP draft proposal. After that, it further develops the proposal by clarifying the new benefits provided to the customer with the actions agreed in the previous chapter. Finally, this chapter first outline how the new benefits should be communicated to the customers, and then summarize all of the above to the draft CVP proposal.

5.1 Overview of the Proposal Building Stage

The goal of this chapter is to analyze the findings of the previous chapter, and through qualitative research of case company experts and customer representatives to develop a draft of the new improved case company CVP. As described in chapter 3, the CVP is a tool which communicates to the customer the case company's ability to share resources and provide superior value. The successful development of a CVP therefore requires customer value research, knowledge of the competitor's value offering and grasp of the critical issues in the business segment. Consequently, the research done in chapter 4 is now applied in the CVP development according to the framework. The CVP development was done in two district phases. The first phase included participants from the case company and the second phase involved customer informants.

The first phase in the CVP development was to gather feedback from the case company development work group. The gathered work group consisted largely of case company lead engineers as most of the identified value delivery obstacles were related to project execution and delivery scope development. Lead engineers in the case company have the overall technical responsibility in the projects. They are guiding the system design and managing the integration of case company solutions throughout the project execution. Although one engineering manager was also included in the work group, his role in the activity was exclusively to be an expert in delivery scope development and

restrain from steering the development effort in a certain direction. In addition to the selected informants, the author also had an active role in the work group as a case company Lead engineer and as the meeting chairman.

The work group meeting was conducted by Skype video conference. At the beginning of the work group meeting the purpose of the meeting was described to all participants and data gathered in chapter 3 was presented via Appendix 4, which also provided structure for the discussions. From the information gathered in the current state analysis, it was already evident that the new CVP requires changes in the solutions offered to the customer. The target of phase 1 was to first agree on the weaknesses to be addressed and then to identify the changes required to overcome these challenges. Next the customer benefits derived from the case company changes were identified. Finally, the communication method of the new customer benefits was chosen. The results of the work group meeting can be found in Appendix 5.

The second phase in the CVP development was the customer validation. The customer validation was done by sending the work group results (Appendix 5) to all the customers interviewed for the current state analysis data. The customers were asked to provide comments and suggestions on the proposed actions. Involving the customer in the CVP development provided an additional medium for customer benefits communication, provided co-created value for the proposal and strengthened the customer relationship. The customer suggestion and comments are evaluated in subchapter 5.5. After the fusion of the work group data and customer validation data the draft proposal emerges in subchapter 5.6.

5.2 Case Company Solution Development

The development work group video conference began with a topic presentation that introduced the weaknesses identified in the current state analysis, found in Appendix 4. Appendix 4 additionally provided structure for the work group discussions as it presents the three categories of information that are discussed: *solution development actions, resulting new customer benefits* and *benefit communication method*. At the very beginning of the work group, all participants evaluated the weaknesses marked with red labels, as depicted also in Figure 8. “Changes in preliminary equipment dimensions” and “load balance calculations” were perceived as the least practical to develop. These were excluded from the work group’s scope of work.

Couple of the lead engineers admitted that even these two weaknesses have caused some tension in their current projects, but tangible corrective actions would not be in the scope of the case company and the issues could not therefore be fixed to satisfaction. The *solution development actions* refer to the actions that the case company needs to take in order to turn the selected weaknesses into strengths. Figure 9 below depicts the actions agreed in the work group.

Weakness	Solution development actions
Monetary value of integration benefits ?	Calculation by the sales support team based on savings on: design hours (€/h), I/O savings (€), etc.
Missing upper level principle drawing	A set of principle drawings per system to be created. Project specific documents created in basic engineering step
Supplier to control and protect aux. systems	Modular power distribution solution with options for starters, aux. control and equipment protection
Equipment characteristi cs frozen 8WAO	New appendix to the technical sales specification with cooling/ consumption/ heat dissipation data
Efficient commissioni ng manage- ment	Step-by-step process for the commissioning ramp up starting with the commissioning readiness estimation
Final docs. delverry Inc. red pens	Harmonized process development for the on-site corrections updating to the delivery documents

Figure 9:Case company solution development actions

Monetary value calculations of the integration benefits were seen as a valuable addition to the generic single system integrator benefits sales materials. One of the lead engineers noted that this action should be relatively painless to complete, as the case company already has all the raw data required for the calculation. As shown in Figure 9, the work group concluded that these calculations should be done based on statistical data and estimations (design hours (€/h), I/O savings (€), etc.). Actual statistical sales

and project cost data should be utilized as much as possible to increase the credibility of the calculations. Average values from multiple projects should be used to triangulate the correct monetary value of the integration work.

The issue of the *missing upper level principle drawings* was seen by all the work group participants as the most important one to fix, as it provides clarity to the complex system integration. One of the lead engineers noted that he has already prepared and supplied similar drawings for one customer. Other lead engineers noted that the existing drawings would present an excellent starting point for the solution development. Information on the drawings should be carefully limited. No component identifiers, cables or specific signals should be presented, only information that is required to illustrate the functional principle of the system.

After a short discussion of the *auxiliary device control & protection* issue, it was evident that this was the most difficult issue to solve in a cost-effective manner, that creates value to the customer. An entirely new dual controller powered PLC solution was concluded to be the straightforward solution, however the solution price would be many times higher than the current protection method (protection through automation). After a long discussion on different approaches to the problem, a solution emerged in the form of modular power distribution solution. The new solution would include a few optional parts in addition to the current scope. Option 1 would include all auxiliary motor starters needed for case company devices. This option would require independent small cabinets, a motor control center or an integration of starter in the equipment by the manufacturing factory. Option 2 would include the control of all auxiliary devices. The control of auxiliary devices may be done with ACS500 remote I/O connected to the propulsion control unit. Option 3 would include independent critical device protection. In this option one set of temperature measurements per consumer is directly hardwired from consumer to the main switchboard protection relay. During the discussion it was noted that all these options have already been provided to different customers as they were requested as an additional feature on top of the technical specification.

The challenge of the *equipment characteristics freezing time* was highlighted among others by the engineering manager. He has felt that this is one of the major pains when the shipyard is dimensioning the vessel cooling system. Couple of the lead engineers noted that the *document delivery 8 weeks after order* (in basic design phase) has also been requested by many shipyards. This request presents a scheduling challenge, as the requested data is available much later in the detailed design phase, when the manufacturing factories finalize the product design. However, it was noted that the data

does not change much from project to project. It is possible to get approximated values from the factories based on the equipment nominal power. It was concluded that in order to meet the 8 weeks after order (8WAO) deadline, the information should be focused on the case company technical sales specification (Appendix). The appendix data should then be directly utilized as a starting point in the project documentation. Finally, it was also noted that a common data template needs to be agreed on between stakeholders.

Efficient commissioning management is already a priority with the case company management. There is already an ongoing process to bring transparency to the commissioning process with checklists filled by the commissioning engineers. This aims to provide order to the chaos known as commissioning. Additional actions on top of this initiative were discussed in the work group. One lead engineer stated that the pre-commissioning checks asked to be performed by the shipyard do not work as the shipyard is not willing to follow the given procedure. This item was also brought up by a customer in the current state analysis interviews. The customer suggestion was to send one commissioning engineer to prepare a readiness evaluation before the commissioning team is sent to the site. In the work group it was considered that the engineer sent to the site would then prepare a report detailing the actions that needs to be done by the shipyard before the commissioning team is sent to the site. Commissioning should be started step by step as the equipment is ready for commissioning. This new procedure would reduce down-time and increase the total efficiency resulting in reduced costs.

The delivery issue of *the final documents* refers to the time gap between the sea trial and the delivery time of the as-built documents containing all the modifications done in commissioning. It was noted in the work group that this is largely a process issue. There is not an agreed upon common way of getting the on-site-feedback back to the office. The changes done in the commissioning are not applied to the as-built drawings according to good practices. It was additionally noted that at this point of the project the manufacturing factory has very little interest to do any work for the project. Documents and equipment from the factory are delivered and payment received. The conclusion of the discussion was that there should be a designated person at the site, responsible for the delivery of all red pen corrections to the lead engineer (at the office). It was agreed that as default this designated person should be the site manager. As the lead engineer receives the update, he should without delay delegate the document revision work to a project engineer. Once the revised document is available it should be uploaded to the electronic document filing system by the document controller. As-built documents

are finally published in one set immediately after a successful final sea trial. The division of the work is one of the keys to success as these changes otherwise may be lost in the lead engineer's work queue.

5.3 New Customer Benefits

After the corrective actions had been agreed on in the work group, the attention was turned to the new benefits these actions would create to the customers. Table 12 below summarizes how the new development actions create value for the customer.

Table 12: New customer benefits

Solution development actions	New customer benefits
Calculation by the sales support team based on savings on: design hours (€/h), I/O savings (€), etc.	Tangible cost savings from the vessel total cost. Justifications for larger level of supplier integration.
A set of principle drawings per system to be created. Project specific documents created in basic engineering step	Clarity to the integrated solution, easier to comment the functionality and less documents to approve.
Modular power distribution solution with options for starters, aux. control and equipment protection	Cost effective integrated aux. controls and reliable equipment protection functions
New appendix to the technical sales specification with cooling/ consumption/ heat dissipation data	Accurate dimensioning of the load balance and cooling system resulting in less costs and time spent in re-engineering
Step-by-step process for the commissioning ramp up starting with the commissioning readiness estimation	Cost and time savings on the commissioning process resulting in reliable vessel building schedule.
Harmonized process development for the on-site corrections updating to the delivery documents	Reliable and on time delivery of the as-built documentation.

System integration benefits are notoriously difficult to quantify. There are many generic value statements that are presented to the customers, but very few tangible benefits. Monetary value calculations are not the overall solution, but a tangible example that anchors the other justifications. Higher level principle drawings in turn provide the customer clarity of the case company solution functionality and therefore make cooperation towards a common goal easier. This development enables the case company to

co-create value in the joint sphere when the project is in development phase. Finally, the last three customer benefits in the above Table 12 focus on developing value for the customer throughout the customer relationship. First, the case company provides accurate information for the customer basic design phase when it's needed. Then, the new evolved step-by-step commissioning process creates value on each successful equipment commissioning step. At the very end of the project the case company utilizes the new effective design change management process to conclude the project successfully and delivers the customer reliable as-built documents. As the project is successfully concluded there is no risk that a failure at the end of the project causes a downward spiraling negative experience to the customer.

5.4 Communication of Benefits

The lead engineer work group meeting assessed that the monetary integration benefit calculations should be prepared by the sales support department and the results should be included in the case company marketing material. The potential value of the evolved commissioning process and professional as-built documentation should be additionally mentioned in the sales process, although the value may be realized only in the project execution. Preliminary versions of the system cooling/consumption/heat dissipation data should be added to the technical sales specification as an appendix. The higher-level principle drawings, modular power distribution solution options and the appendix for the cooling/consumption/heat dissipation data should also be added to the project standard delivery documentation. These documents should then be highlighted to the customer in an early phase of the project as they represent potential for value co-creation. The target should be to involve the customer more in the system design phase through the selection of variable optional parts, sharing of critical design information and system functionality validation.

5.5 Customer Validation

An open format questionnaire was sent to the four tier 1 customers interviewed for the current state analysis. The questionnaire can be found in Appendix 6. Three of the customers gave answers and provided additional comments for the proposal. Generally, all the customers who provided feedback to the proposal were pleased with the actions suggested and seemed satisfied to be part of the development process. One customer commented that the options described in the modular power distribution solution should be clearly described as not mutually exclusive, as they were interested in the complete

package with all the options. Another shipyard representative commented that the commissioning work hours should also be considered in the integration monetary value calculations and provided the following quote regarding the modular power distribution solution:

> *In my opinion the ideal solution for the shipyard, valid for every system, it would be that ABB system were a "black box" with the power inputs for the generators and some I/O interfaces for the Power Management System and ship monitoring control system only. It should be a self-containing system as much as possible. So that, all the three below list options would be guaranteed by ABB.*

Additionally, one customer commented that ABB should also evaluate the entire equipment delivery process. He raised the question if some of the activities done on board could be performed already in the factory (pre-delivery). Another customer raised a similar point with an example of the ethernet switch configuration work that seems to be outside of the work process as it is sometimes done on board, sometimes in the factory and sometimes it is left to the sea trial (by mistake). All comments raised by the customers had good merit and were based on first-hand experiences. The feedback received from the customers re-enforced the assumption that real-life customer values were captured by the improved customer value proposition. The feedback received from the customers additionally enhanced the modular power distribution and commissioning process actions.

5.6 CVP Proposal Draft

It was determined that a mere shift in focus would not be enough to captivate the customers' interest and fulfill the need that emanates from the customers' unfulfilled value dimension expectations. The new CVP draft proposal, depicted in Figure 10 consists of a strengthened CVP canvas which is built on a strong foundation of formative actions, customer benefits and communication.

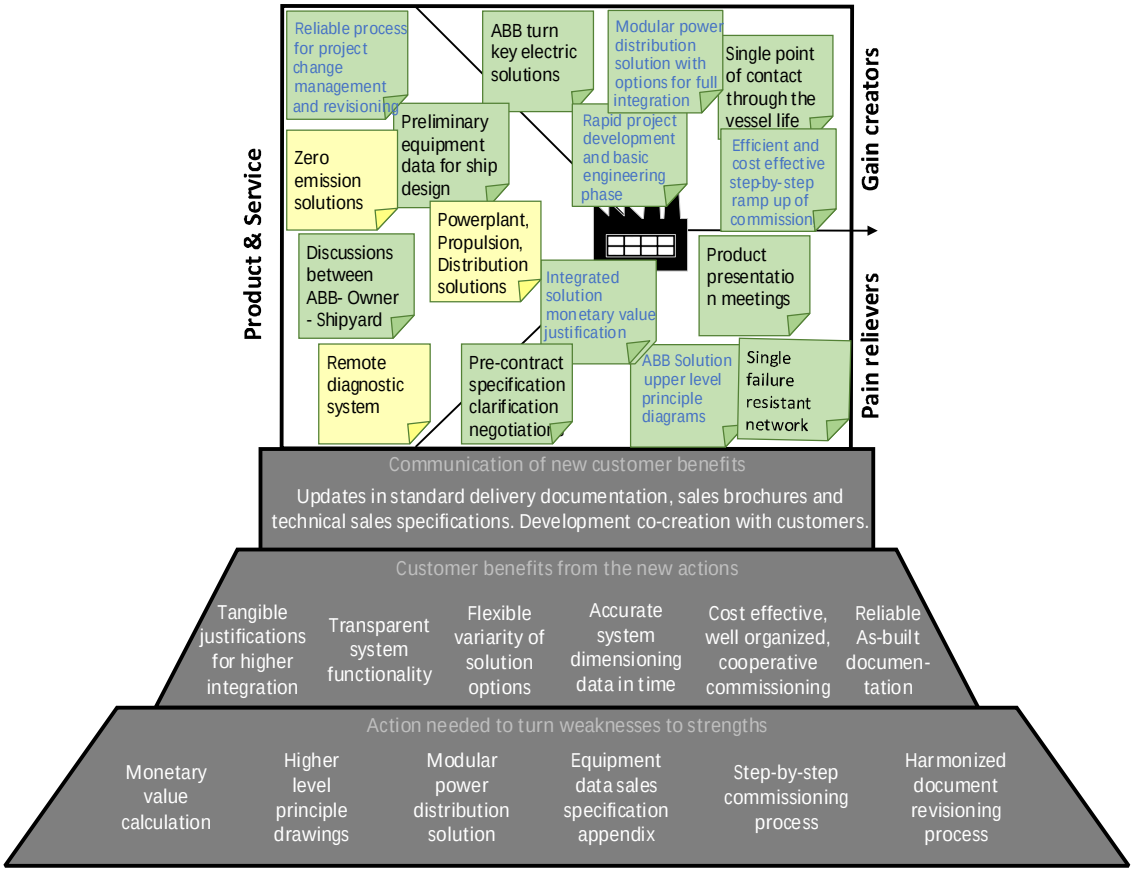

Figure 10: The CVP draft proposal

On the top level, inside the canvas, six new strengths (green labels with blue text) have been cultivated through the actions design in the lead engineer work group. Strengths are developed from the needs of the customer and filtered through the offering portfolio of the competitors. What is left will provide resonating focus with the key customers as the points of parity and low priority items have been omitted. In addition, the canvas encompasses existing items identified in the current state analysis. These items were already in place and are considered as key strengths by the customers.

Even a few existing strategic points of parity (yellow labels) are left in the CVP, as these counter the competitor's offering. These yellow label items prevent the competitor offering to provide resonating focus with the customer. It is especially important to stay on top of the mega trends like digitalization and zero emission technology as these are the "front runner technologies".

Below the canvas there are three layers of foundation work that is described in previous chapters. At the very bottom of the CVP there are six formative actions that enable new customer benefits. These actions were developed from the red label items isolated in the current state analysis, depicted in Figure 8. The new customer benefits described on the middle part of the Figure 10 CVP foundation, are derived from the formative actions. These new benefits create the new reality where the new strengths (green label items) are possible. Finally, the top level of the CVP foundation relates to the communication of the new benefits. All the above actions are futile, if the customer remains oblivious of the new benefits. The top part of the foundation lays the groundwork for involving the customer in co-creating new value with the case company.

The CVP development fieldwork began with the current state analysis, which considered input from the case company sales department, competitor brochures and key customers. The current state analysis was followed by the proposal development phase where the case company lead engineers were involved in the work group meeting. The next chapter begins from the CVP draft proposal, which is presented to the upper management level of the case company. The managerial input received is the final piece of the CVP development fieldwork. The next chapter presents an improved CVP to the ABB Marine Electric solutions department, which was the objective of this thesis.

6 Validation of the Proposal

This section evaluates the initial CVP proposal and provides feedback for the proposal finalization. First the section provides an overview of the validation method utilized and presents the steps taken in the validation process. Next, this section summarizes the findings from the CVP proposal evaluation meeting. Finally, this section describes the changes adapted to the initial CVP proposal and presents the final version of the improved case company CVP, which is the result of the validation stage.

6.1 Overview of the Validation Stage

The initial CVP proposal was validated in an upper management thesis evaluation meeting. The Vice President of the Electric solutions department and an engineering manager were present at the meeting. Additionally, the sales support department manager was invited, but he was not able to attend the meeting. The participants of the meeting share an overall responsibility of the thesis focus area (the Electric solutions department) engineering development. Additionally, the department Vice President is responsible for the approval and deployment of the department's CVP.

The goal of this section is to finalize the developed CVP and achieve validation for the research. The evaluated research consists of the fieldwork carried out in the data collection steps, the theoretical bases of the proposal building and the presentation of the initial CVP. The evaluators first considered the correctness of the informants and the quality of data collected. Next, they considered the utilized framework and the presentation of the thesis. Finally, the whole content of the initial proposal, depicted in Figure 10 was appraised. Based on the feedback received in the evaluation meeting, the final proposal was drafted and is presented in Chapter 6.3.

6.2 Key Stakeholder Feedback

The proposal evaluation video conference began with the thesis presentation that consisted of all the research steps ending to Figure 10 (initial CVP proposal). The thesis presentation consisted of a narrated 8-page PowerPoint presentation. Participants were encouraged to interrupt at any point of the presentation to comment or criticize. The presentation started with the introduction of the business challenge, research design, data plan and theoretical background (existing knowledge). The topic of the thesis was commented to be very important, “the corner stone of selling”. The meeting participants could see the strong connection to the case company’s 2025 strategic targets. The research design was also seen as professional and very detailed. The data plan of the thesis raised some questions of the generalization of the research results. The evaluators pondered if all the findings can ever be adopted to all vessel segments or should dedicated customer value propositions be created. In the meeting, the author described how similar issues raised up across all the interviewed shipyards. The existing knowledge segment raised only a few questions. Presenting of the core concepts was done in a well-structured and informative manner. Some follow-up questions were raised from the frameworks label color coding, otherwise the framework model was considered visually easy to understand.

The research presentation continued with the current state analysis and the development of the initial proposal. This section raised some additional questions. There was some doubt if enough key customers had been interviewed for the current state analysis and if the shipyards really want what they say they want. The engineering manager pointed out that shipyards may very easily write up a wish list without considering the increased cost effect. Some of these worries were mitigated by the development actions developed in the initial proposal phase. The Vice President of Electric Solution considered the initial proposal to be very detailed, a little bit too detailed. From the evaluators’ comments, it could be construed that the proposal looked too much like an engineer had done it. According to the Electric solutions department Vice President the upper level of the proposal was missing the “elevator pitch”. Final concluding words in the meeting were that the thesis presentation was top quality, however the main message could be further filtered and crystalized to a compact sales pitch.

6.3 Summary of the Final Proposal

The final proposal of the Electric solutions departments improved CVP, consists of the first draft proposal CVP, enriched with the feedback from the thesis evaluation meeting. The author considers that complicated issues cannot be fixed by simple solutions. The final proposal depicted in Figure 11, takes in consideration the key message from the proposal validation meeting, and includes a sales aspect of the CVP. It provides one additional layer to the proposal to facilitate easier access to the CVP. On the top of the CVP canvas there is a "selling the CVP" layer, which crystalizes the key selling points of the CVP in four marketing statements and four keywords.

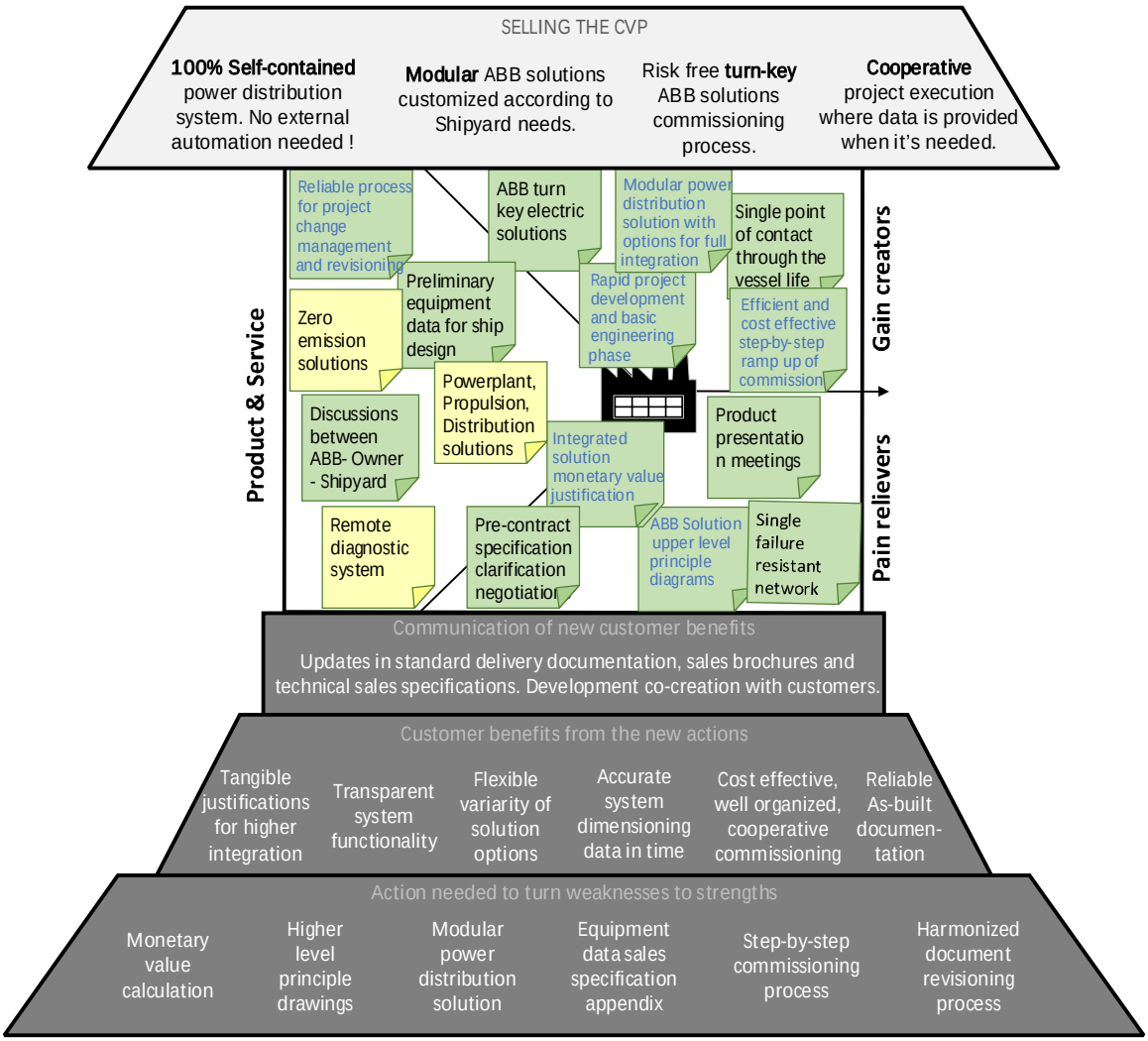

Figure 11: ABB Marine Electric solutions department improved CVP

The final CVP includes the following four selling points: self-contained, cooperative, modular and turn-key. *100% self-contained* refers to the case company's ability to offer a power distribution solution which doesn't require any connection to an external auto-mation system. Auxiliaries are controlled by the case company logic, and equipment

protections are included in the main switchboard scope of supply. This removes the need for shipyard integration all together, saves design hours and automation system costs. The equipment's temperature measurements directly hardwired to the case company main switchboard provide superior resilience to failure as there are no components between the temperature sensor and protection relay.

Modular solutions give more control to the shipyard. The case company solution can be tailor made based on the options chosen for the system. A firm price for different options is provided in the quotation phase, and the shipyard has the possibility to upgrade the system even in the project development phase. This modular solution provides the possibility to quote the system with a lower price and co-create the final solution in the detailed engineering phase with already agreed pricing.

Commissioning is one of the places where both parties (customer and case company) are looking for ways to improve. The biggest obstacle for the shipyard and case company is the unpredictable nature of the commissioning process. As there are already on-going efforts in the case company to increase transparency of the commissioning process, and new actions created in the solution development phase, the case company should offer the commissioning with a turn-key approach. This would appeal to the customers as a major risk reduction and would free up contingencies. The message of confidence and expectation of efficiency will be even more valuable.

As the case company does not sell products off the shelves, they must accentuate their cooperative approach in the project execution. The cooperation begins in the very beginning of the project, when we differentiate by offering the customer a proper start up package of product information, supporting the customer's design work. Next, the case company present the solution functionalities with an easy-to-read principle drawing, in order to build a common understanding of the interfaces and command hierarchies. Finally, the project is concluded in a manner that leaves the customer satisfied as the as-built documents are delivered in a format preferred by the customer, exactly when expected by the customer.

The next chapter will contains an executive summary of the thesis study and provides information of the next steps to be taken as the proposal above is implemented in the case company.

7 Conclusions

This chapter starts with an executive summary of the thesis, including descriptions of all the steps taken in the research. This is followed by a short description of the steps that should still be taken. Finally, this chapter is concluded with the thesis evaluation criteria and closing words.

7.1 Executive Summary

Competition in the marine sector is brutal as more and more players enter the market, and some of the old customers are starting to think they could handle the system integration themselves. The case company has so far utilized the Azipod propulsion system as their one inimitable anchor product that has opened the doors to forever expanding solution portfolio. The business challenge now is that many customers are pushing the door shut. The shipyards are trying to limit the case company scope of supply to minimum, as they do not see the benefits of the case company integration and distribution solutions. The objective of this thesis is to justify the case company premium priced Electric solutions to the customers with a new enhanced customer value proposition.

The thesis' research method is design research. No new scientific breakthroughs were targeted. The thesis research was mainly conducted as a qualitative research and focused on discovering new information of the customer needs with structured interviews. Five customers and four case company sales managers were interviewed to gather information how the case company offering fits the customer expectations. The results were analyzed and compared to the competitor offerings, with a unique conceptual framework derived from a few respected scholarly framework models. Next, a new draft CVP proposal was developed from the interview results in a lead engineer work group. Finally, the work group draft proposal was further developed into the final version of the CVP after receiving feedback from the case company management in a validation meeting.

The interviews of the case company sales managers and customer representatives were used to establish the current state of the case company CVP. It was evident in the interviews that the current customer value proposal of the case company is focused only on tier 2 end customers (vessel owner). The case company image may be perceived as arrogant as they supersede the shipyard (tier 1 customers) and focus mainly on the vessel owner's needs. From the current state analysis interviews eight critical

pressure points were identified. These critical points represent the high priority areas which require immediate improvement actions. Issues were prioritized based on importance to the customers and whether the competitors were already fulfilling the specific customer need.

The eight identified development areas were discussed in the Electric solution department lead engineer work group, where the issues were prioritized according to improvability. The top six issues were considered possible to improve by the Electric solutions department actions. It was evident for all parties in the meeting that a mere shift in marketing focus would not provide a competitive edge and therefore, formative actions to improve each of the six points were identified. Furthermore, six new customer benefits were derived from the new actions. These new benefits made it possible to turn the six identified critical points to strengths as depicted in Figure 12.

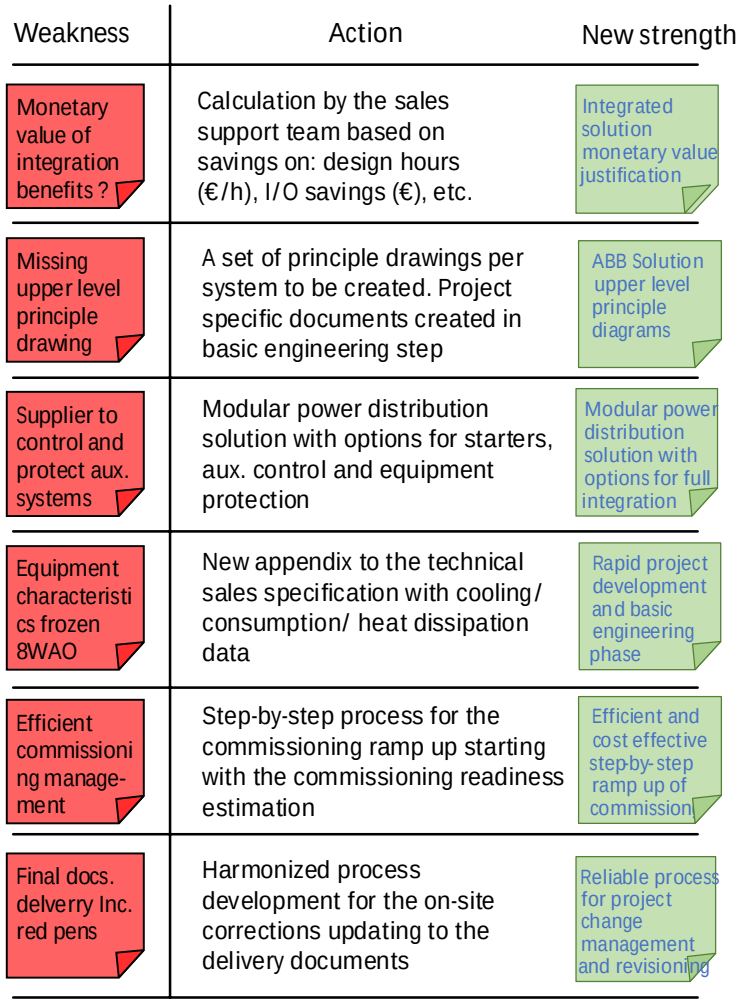

Figure 12: Weaknesses turn to Strengths

Finally, a short benefits communication plan was created to share the new reality with the customer. In the proposal validation meeting the proposal was further crystalized to include four key selling points. These selling points are co-operative, self-contained, modular and turn-key solution. These selling points summarize the customer values dimensions which are fulfilled by the new improved CVP that is built on the foundation of formative actions taken.

7.2 Managerial Implications

The successful implementation of the new developed CVP requires considerable engineering efforts from the case company. The improved CVP already includes a set of practical actions needed to be taken in order to enable the new values offered to the customer. The actions have been developed together with the electric solutions department lead engineers and therefore minimum resistance to change is expected. However, all the development projects should be initiated from the top management in order to reflect the full support of the case company management. The development efforts are recommended to be divided according to desired outcomes to three separate work groups. The focus of these work groups should be in case company equipment functionality development, process development and monetary value calculations & documentation.

The *equipment functionality* work group should develop the technical solutions for the power distribution systems scope. The key development activities would be first to design the standard communication and control interface of the case company auxiliary devices. This design work would include the hardware selections and interface options to case company PLC controllers. Next, the work group should consider the appropriate main switchboard protection relays for different optional delivery scopes described in Chapter 5.2 and decide on the device protection functions. Finally, the work group is tasked at preparing the standard higher-level functionality drawings of the different systems.

The process development work group targets to develop and document the improved as-build documentation and commissioning processes. Both developments should be followed with a pilot implementation and internal validation process. After the initial process development plan has been formulated, this work group is in its core all about change management. The pitfall of any new operational process is the implementation. This requires relentless execution and supervision of the developed new process. It's important to involve the persons responsible for the pilot project early on and establish

that the development has strong backing from the top management. As with all change management projects it is imperative that the pilot project members buy in to the new process and spread the positive message.

First the monetary value calculations & documentation work group should focus on quantifying the integration benefits monetary value. First, the work group should research the case company ERP database for engineering hours spent on integration work and then research how much signals and functions are included in the case company systems. Next, the market value for the saved functionality design hours and hardware should be analyzed. Next step in the work group should coordinate with the manufacturing factories to prepare a database of the basic engineering information (aux. device powers, heat dissipation and cooling water flow/pressure drop/temperature) as a function of the equipment power. Alternatively, the above information should be acquired for each quotation separately. The information gathered should be included in the contract technical specification appendix to enable the shipyard to begin their design on time, based on case company values.

7.3 Thesis Evaluation

The initial objective stated in Chapter 1.2 was to develop a new improved CVP for the case company Electric solutions department. Already early on in the current state analysis, it was evident that the case company caters for two hosts. According to the upper level corporate strategy, the case company is developing values that the vessel owners appreciate. These values include, but are not limited to higher vessel efficiency, silent operation and lower emissions. Shipyards are tier 1 customers of the case company, and they do not care about the vessel properties, as long as the vessel owner's technical specification is fulfilled. As a direct result the case company is the preferred supplier of many vessel owners but seen as an arrogant multinational company with too much influence by the shipyards.

The split interests of tier 1 and tier 2 customers presented a problem in the solution development phase as the new improved CVP should have a narrow focus to issues that resonate with the customers. The main focus of the research in the thesis was aimed at tier 1 customers, the shipyards, as they were the unsatisfied party. This decision was also guided by the fact that the Electric solutions department operates mostly with the shipyard. Vessel owner interests should be targeted higher up in the corporate management. Although the scope of the research was rationale focused, some doubt remained on the generalization of the results. The doubt remains if the developed CVP

is applicable for all the shipyards. The research answers to this question by considering all the pains of the interviewed shipyards equally, regardless of the shipyard size. Additionally, one could see the same themes repeated across the shipyards demonstrating sufficient informant saturation. In the end, the research does fulfill the objective of developing a new improved CVP for the Electric solutions department. The new CVP is thoroughly grounded to existing knowledge of the field and the research followed good academic principles. The following subchapters go through the main evaluation criteria of the thesis research.

7.3.1 Validity and Reliability

"Information is raw material for science, and it is processed with the correct methods to get a creditable end result." (Kananen 2013) This thesis study is evaluated based on four main criteria which are: validity, reliability, logic and relevance of conducted study. The credibility concept of validity refers to the aptitude to research the correct issues/subjects. If the "raw material" is faulty, the correct methods of analysis do not help. The research can rarely be conducted to everybody who is concerned in the study (population). Therefore, a selection of good representation of the researched subjects must be selected. The selected subjects should form a small-scale model of the population (sampling method) so that individual opinions are not affecting the results. (Kananen 2013)

Quantitative research relies on external validity as one of the most important credibility criteria. By its nature quantitative research must possess generalizability. The research results should hold true in similar sampling groups. In design research external validity is rarely an issue, as the research usually concerns most of the people involved with the development effort. Additionally, design research never aims to generalize the research to the degree of full repeatability. Another sub-category of validity is content validity. In content validity the correctness of the measured variables is considered. The variables used can be justified by referring to earlier research where the functionality has been tested. In design research it is also important to have structural validity. The research must follow the theoretical framework which is selected for the study. (Kananen 2013)

In qualitative research the validity and reliability of the study focuses on information accessibility, consistency of interpretation, credibility and saturation of sampling. It is important that all the choices and solutions taken during the course of the research study have been well documented. Good documentation provides accessibility to the research process and provides justification for the results. Most of the qualitative data

has room for interpretation. The data should be interpreted as it relates to the research questions. In some cases, another researcher may be asked to make an interpretation in order to draw objective conclusions. Credibility validation relates to the interpretation of the answers gathered from interviews. Credibility may be achieved by asking feedback of the interpretation by the informant directly. Information saturation refers to the correct number of informants. The point of saturation is reached when interviews do not provide new information. (Kananen 2013)

In this study, validity and reliability were planned to be ensured by taking the following steps. The research study follows a strict well-established theoretical framework and thus ensures good structural validity. Reliability of the collected data was enhanced by triangulating the data from multiple sources. In addition, data was collected in three separate stages until the saturation point was sufficiently reached. Informants were also selected so that they are in “normal working condition”. Interviews were carried out when there were no abnormal stress factors present and there was sufficient time to conduct the interview without interruptions. Additional credibility validation was achieved by involving the informants in the CVP draft proposal validation. Finally, all fieldnote summaries have been documented in Appendix 3 to provide good information accessibility.

7.3.2 Logic and Relevance

“Research design will be based on a flow of logic and a number of assumptions, all of which must stand up to the closest scrutiny” (Saunder, Lewis and Thornhill 2007). Logic in a research and development project can be described as coherent steps taken to arrive to the research outcome. In this study, the research plan presents the logical flow from objective to result, and the necessary steps in between. In the literary review, the conceptual framework was developed based on the objective of the study. In the current state analysis and proposal development stages, the established conceptual framework was utilized and the first draft CVP proposal was formed. The proposal validation builds on the CVP formed in the previous step and finalizes the results based on the feedback received from the case company management. The entire research plan was developed so that the next step was always built on top of the previous one.

According to Quinton and Smallbone (2016) relevance can be described as assessment of the importance the of topic in its field and the contribution it makes to literature. In design research, the relevance criteria are directly related to the specified business challenge. All the steps in the study should be built to direct to the objective of the study. Throughout the different steps, during each step the relevance to the original business context need to be checked.

This study focuses on the development of a new CVP to the case company. All steps were built to reach this goal. This study was executed according to the research plan and all the interviews were conducted to gain critical information in accordance with the conceptual framework. All the informants are in key roles related to the business challenge. The conceptual framework utilized was built from widely accepted models in the scientific community and therefore stands on its own merits. The developed solution was co-created with the customers and reviewed with key stakeholders to confirm relevancy of the new CVP. This completes the thesis evaluation chapter. The following subchapter offers some final closing words which will conclude this thesis.

7.4 Closing Words

The economic situation in the world is constantly developing. Even while writing this thesis there has been a rapid shift from builders' market to buyers' market in the marine sector. The whole industry power dynamics shifted in a matter of weeks as the whole world experienced a so-called black swan scenario where an unpredictable event causes severe impact to the normal operations. In this case the disruption was caused by the CONVID-19 pandemic which actively shut down the entire cruise market. The situation we face now is only one extreme example. The ones who are able to adopt, adapt and improve will prevail through the changes. First, we need to adopt new improved ways of working and continue to provide value to our customers. Next, we need to quickly adapt to changes in the market while keeping the company's strategic direction. Finally, we need to start the improvement cycle again and re-invent our value offering as needed. In the words of the former president of the United States of America, Barack Obama:

> *Change will not come if we wait for some other person or some other time. We are the ones we've been waiting for. We are the change that we seek.*

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Customer interview question for Data 1

1. What are the most important milestones in your work? Why?

2. What is the key input required from ABB pre-contract / just after contract / during commissioning / after sea trial? Why?

3. When should the equipment dimensions / features be frozen? Why?

4. What are the decision criteria when you decide on the equipment supplier?

5. What are the most challenging issues in reaching the delivery deadlines?

6. What are the most common technical difficulties and when do they appear?

7. What is the most frustrating issue in your latest project?

8. What issue has caused the most extra working hours in the latest project?

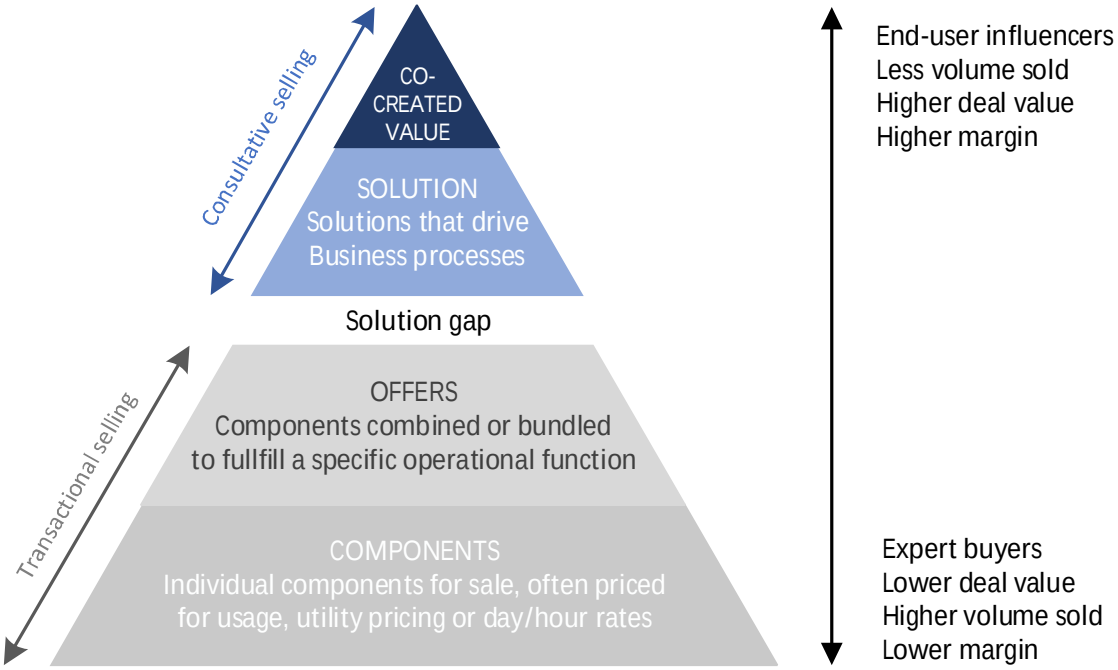
9. What do you see as the biggest risk to successful project execution?

10. What kind of saving are the most important money / time / effort?
    a. cheaper with less features and integration
    b. faster with higher price and less customization
    c. higher integration and customization with higher price

11. What are the key features you would like to have on the products that are not met at the moment?

Case company interview question for Data 1

1. What are the main competitive product features highlighted to the customers?
2. What kind of customer problems are target with the marketed solutions?
3. What product and services ABB ES markets to the customer and where do they fit at the value pyramid below?



4. How are the integration benefits of ABB solutions marketed?

5. What is the ABB ES main competitive edge and how is it utilized?

6. What are the different steps in the sales process?

7. How are the new product features and differences between product families highlighted to the customer pre-contract?

Interview field note summary

Informant: Customer 1 (tier 1) **Interview duration 57 min.**

Lucio Vallerga
Technical Project Manager
T. Mariotti Shipyard

Lucio is responsible of all Project development, all ship systems (inc. all auxiliary systems), mechanical and electronical parts. Project is divided in the beginning to major design steps. First step is basic design ship speed and type of service, ship, length, number of passenger etc.. Also all liquids on board are locked (cooling water, lubrication oil, portable water, gray water, balance tanks).

Second step is load balance is calculated. Estimation for cooling and accurate data of main power consumption is required. Main engines and generator size are validated. Next all main machinery (generators, transformers Azipod etc.) is preliminary chosen and placed on the GA. Final technical speciation signed between yard and owner. This step is still pre-contract with the case company. Design is done according to preliminary calculations. The sizing of many systems is done based on experience. Lack of accurate “final version data” is a risk.

Third step is the contract with subcontractors and finalization of the detail’s technical details. All critical values (dimensions, cooling data, power consumption, weight) should be frozen two months after contract signing. Cooling water data one of the most important information’s.

All data from case company is considered to be on acceptable level. Delivery scope should be more accurately limited on the specification. Number of documents should be limited. Instructions are to be clearer. Document delivery should be more structured. Document management to be improved (better categorized according to main equipment and not delivered one by one). Documentation should be simplified. Documents should be evaluated and discussed together. Ships are more electrical, more networks, more PLC. Shipyard feel that the automation and control systems are more and more demanding and not 100% under the shipyard control (not enough personnel).

Prompt replies from ABB to yard questions has made the rapid project execution possible. Yard comments the principles. Details of the equipment are not interesting. Supplier is trusted on design details. Simplification of documents. Yard wants upper level principle drawings not technical details.

Yard wants to have less makers, less interfaces and less contact persons. Equipment solution should take care of it's own auxiliary systems: aux. starters, protections etc.. Yard does not want to take care of the small aux. systems. Equipment belonging to same major systems should have the same supplier.

Most challenges to meet the delivery schedule come from preparation and project development. After equipment delivery everything goes smoothly. Resources should be placed on the first three months of the project after contract. Better preparation pre-contract: document delivery list to include "for owner approval" column. Shipyard see no problems in the harbor trial or sea trial execution.

2. Informant: Customer 2 (tier 1) Interview duration 41 min.

Representative of a shipyard with longstanding business relations with the case company

Commercial information (price) is the most important aspect pre-contract. Overall dimension (equipment footprint) of the equipment is almost as important as the price in yacht and small cruise ships. Not necessary always to have as small as possible, but suitable size to fit the General arrangement. Data given in the preliminary, pre-contract phase must be respected. No major dimension increases. If solution does not fit to the available space shipyard will discard the solution (resulting in lost business for the contractor).

Supplier must have the technical knowledge to promptly comment if a proposed shipyard solution is feasible or not (e.g. switchboard location so that the maintenance access is only from front) and with what cost. Service area needs to be included on the data given pre-contract. Service area and weight should be as small as possible. There is no general preference between two large cabinets or equipment distributed on many small enclosures. Very much project dependent. Shipyard would expect higher level of flexibility on the dimensions of the equipment from the case company based on specific project needs. Not only ready solutions.

After the contract signing most important information is the cable pulling list and all other interfaces (piping, cable tracks, etc.) with the external systems. Many times, contract has been signed only after the ship building has started. Circuit diagrams of the equipment are not of inters to the shipyard. The cable contractor needs a cable list of each system. Preliminary aux. cables should be +- 10% accurate at the very early

stages of the project. Most difficulties come from the equipment locations in the “small” vessels. Supplier should not have very un-usual requirements from external interfaces or installation (extra cool cooling water, EMC performance, spring basement…). Well established, non-changing interfaces are seen as big benefit. Interfaces should not change after the freezing point.

Equipment must be delivered on time to the shipyard. Late delivery of the major equipment like the switchboard jeopardizes the entire ship building schedule. Highest risk to successful project execution is that a supplier of one of the major equipment cannot fulfill the specification or is lacking of the “financial muscles” to see the project through. Although the most important factor is the price of the equipment. All integration benefits and additional features should be shown as money savings in the contract negotiation phase. Later on, the project technical features are more important than monetary value. Supplier should be extremely transparent on the scope of delivery: what is included and also what is NOT included. Options should be explained. What are the optional features used for? What is the gain?

Case company product features fully comply with the shipyard requirements. The technical approach and the superior customer care make the case company the best supplier that the shipyard has at the moment. Shipyard is extremely satisfied on the level of technical support, quick answers and cooperation of the case company. Case company quotation is many times the most expensive, but it brings the top-quality equipment and world class service. Then again in the beginning Price matters.

3. Informant: Customer 3&4 (tier 1) Interview duration 64 min.

Representatives of the Helsinki Shipyard senior management

Important milestones in shipyard work

Consept-closeout, Offer deadline to Owner, Shipbuilding contract signing, Yard Basic design start, System documentation from supplier, Freezing of design, Yard Detail design start, start of production, delivery of main components, installation inspections, follow-up-meeting prior to commissioning, startups, commissioning, IHM, asbuilt documentation from supplier, harbor trials, seatrials, delivery of the ship, starting of warranty.

Input required from ABB pre-contract / just after contract / during commissioning / after sea trial?

Scope of supply, single line, dimensions, weights, / System documentation from supplier / corrected design material, progress reports. After sea trial all certificates, declarations (e.g. inventory of hazardous material), final documents and closed remarks should be delivered to shipyard.

The dimension which are got pre-contract should be respected. After contract dimensions should be confirmed within 4-8 weeks after contract signing. At the beginning of the project there should be multiple face-to-face meetings in order to see the positions for yard interfaces in the equipment. Where should the inlet for cooling water be? On which side the aux. cabinets should be located. Which machines should be mirrored? What equipment could be changed to water cooled (what is the price impact)?

At the beginning of commissioning there should be a pre-commissioning check and closing of FAT remarks. The commissioning itself should be in many steps. First only one or two engineers for pre check. Later increased manning (with correct people). Flexible star of the commissioning. Red pen corrections should be gathered to final documentation with a more structured manner in order to get the final doc. set in time.

Decision criteria when you decide on the equipment supplier?

Total cost to Yard, fluent co-operation, reliability. Yard choses the suppliers and gets approval from owner. If owner wants more expensive supplier shipyard is compensated.

Most challenging issues in reaching the deadlines?

Getting the proper binding and correct documentation from supplier in time, get the supplier to understand the spec is spec, not wish list, the same challenge with comments

Most common technical difficulties and when do they appear?

Documentation and reality don't match, suppliers reluctancy to follow Yards instructions and comments. All additional features should be justified. When new generation of a product is delivered the differences and benefits should be clearly presented well advanced (pre-contract).

Issue which cause the most extra working hours?

The above mentioned, comments are not listened/corrected, or corrections made carelessly. Biggest problems come from mistakes in drawings which cause double work e.g. mistakes in the cabling drawings.

Biggest risk to successful project execution?

Schedule keeping.

What kind of saving are the most important money / time / effort?

Minimum features to fill the ship specification; all extra features causes additional costs to Yard c option is the trend in the shipyard. Justifications and benefits to be clearly informed.

What are the key features you would like to have on the products that are not met at the moment?

Products are good, no features missing at the time.

Yard sees the benefits in getting actual "turnkey" solutions where the integration responsibility is with the supplier. On the other hand, the shipyard has the end responsibility (if e.g. the ship delivery is delayed). Shipyard calculates (sometimes) the saved engineering hours if there is a larger solution scope in a single supplier. Shipyard would prefer to have the auxiliary starters included in the supplier's scope. MCC in the Azipod room. MCC to be also controlled also by supplier. If trips and alarms would be also controlled by the equipment supplier, the solutions would be better. Supplier would leave aux.device start automatically or manually from Supplier own local panel. MCC could also be is a fieldbus.

The supplier should bring the larger solutions to shipyard attention before contract negations, so the idea could be pitched by the shipyard to the owner. e.g. automation solutions which includes I/O savings as ABB signals will be in the fieldbus. Many options should be offered as alternatives in the quotation.

Informant: Customer 5 (tier 2) **Interview duration 125 min.**

ABB are considered to be a premium marine equipment supplier. ABB have managed to maintain competitiveness, while maintaining a high quality and comprehensive product range. The owner is extremely satisfied with the quality Vs Price of ABB brand products. There is concern about ABB Marine's performance in application engineering (project-by-project). Skilled manpower availability being the perceived issue. Many shipyards have raised this issue separately. Also concerns about the delivery of non-ABB brand transformers. Sale of power grid business, including transformers, is seen as a risk, with the prospective of seeing non-premium products in the future. ABB Marine has not necessarily applied the expected degree of technical scrutiny to any third party transformer company; considering the expertise that the wider ABB used to hold in this area. Concern over future supply of power and propulsion transformers with sale of business unit to Hitachi. RESIBLOC from Brilon is the owner's transformer of choice at present.

Interaction between business units is considered to create some friction. The customer is not seeing the one simple ABB. Technical issues have perhaps arisen due to lack of technical coordination between business units, for example Azipod and converter for radial bearings issue. This silo effect also has an impact on the conduct of commissioning and sea trials.

ABB Marine have been relatively poor at controlling software versions and/or parameters. Total failure for main integrated automation system, to the extent that ABB Automation has effectively left the market for many owners and shipyards. ABB automation has failed to convince operators and shipyards that it can properly deliver an automation system to a large cruise vessel. ABB need to improve software control. On many occasions, significant time has been lost on sea trials where lack of control of software settings/parameters has proved to be the main problem. Furthermore, there have been instances where issues at on in-service vessels have been traced to incorrect set-up. It is clear that ABB Marine does not always properly control the set-up of equipment during the factory acceptance tests and commissioning. Recent examples have included the FRER switchboard transducer (lost time on sea trials), set-up of MOXA Ethernet switches at switchboard FAT, propulsion converter parameters (issues with firing through and ride through in-service, and set-up during commissioning).

ABB needs to further develop system network resilience. ABB systems have been seriously affected by communication network failures – for example total loss of propul-

sion, prolonged black-outs etc. A large part of the issue has been the MOXA Ethernet switch failures – ongoing. Further work required for network resilience, but significant advances already made.

ABB need to improve the process of introduction of new products to the customer. Unforeseen cost is a real issue for the shipyard and the final customer. It is recommended that equipment product managers are more responsive to ABB Marine project requirements.

ABB often fail to make clear to shipyards owner, what 'options' are within scope at the point of contract signing and/or equipment ordering. The identification of such options requires a high degree of product knowledge, which often only becomes wider knowledge at the point where ABB are already manufacturing the units. Early in the process, ABB exclusively hold the knowledge, and do not always advise the customer(s) to the appropriate level. e.g. lack of bearing online vibration monitoring as standard likely to affect owner's decision whether to arrange remote condition-based monitoring service agreement. Cost of unit could be offset by ABB in attempting to secure in-service support contracts.

During the plan approval stage of a project it became apparent that ABB would not be supplying all options. Of particular note is the omission of the automatic greasing for the slewing seal/bearing and propeller bearing. The operating-line considers this to be more burdensome for the ship staff. On the Azipod XO automatic greasing of the slewing seal is a now standard measure for improving seal reliability; correct rate and better distribution around azimuth angles.

Another issue with the supply of the Azipod DO related to steering drive power supplies. The typical arrangement for the Azipod XO is a normal and emergency supply to each drive, with an internal change-over switch. ABB originally proposed for each Azipod: one drive with normal supply only; and another drive with emergency supply only. The result of this is that a single variable speed drive failure may result in the ship not being able to leave port. The original redundancy level, whilst sufficient for meeting the regulations for a single failure whilst underway, did not necessarily reflect the customer impact of such a failure – potential change of itinerary. ABB claim the power supply as proposed is the standard for the Azipod DO; but some owners it was not acceptable for the market sector. Owner was able in the end to obtain at no cost dual supply with an external change-over. However the process was difficult, and a compromise on the engineering implementation; second ship will have an internal change-over.

The shipyards could help here in general by releasing documentation well ahead of manufacture start and factory acceptance testing. Improvements are being made here, for example with shipyards discussing with both ABB and the owner the remote control system for a new project, with the purpose of avoiding any punitive cost associated with perceived ‘changes’ (from the perspective of ABB).

ABB business units from the customer perspective appear to act in silos. The internal silos within ABB can make product application engineering difficult for marine projects. ABB equipment considered to be at the high end of the market, meaning that ABB Marine’s success is dependent on proper access and application input to these products. Product managers for equipment which mass market is not marine need to support ABB Marine in continuing to be a preferred integrator.

A relatively small vessel resulted in the need for more space efficient equipment. ABB selected the UNISEC switchboard manufactured by ABB SACE in Italy, a first for the owner as a main switchboard. It is relatively recent (approximately 2 years it is thought) that the UNISEC product has been made available as a main switchboard for the marine market. The UNISEC is a basic switchboard, with less internal segregation than the more common (for owner) UNIGEAR. However the unit is in general fit for purpose.

It is apparent that there has been a very high turnover of engineers within the last 12 months at ABB Marine, diluting the knowledge and experience necessary for the integration of complex systems. Owner is seeing already a greater variation in the level of engineering on a project-by-project basis, whereas the drive is for standardization of sound technical solutions. Owner still has faith in the ABB product range, but is increasingly concerned in the application element – which is ABB Marine’s core business.

ABB have had a sequence of difficulties during commissioning, largely based on their ability to have the correct manpower in place for commissioning. ABB are extremely busy, especially in the face of the ongoing work related to the bearing failures.ABB Marine needs to maintain ownership of critical functionality within the power and propulsion system. The use of contractors requires proper oversight.Manpower stresses are creating the situation where common requirements are being tackled in different ways, resulting in a lack of standardization from ABB Marine.

ABB have struggled to provide stable commissioning teams for projects, particularly in Italy. Consistency in communication and engineering has been an ongoing issue. For example on recent sea trials, ABB struggled to complete the set-up of the propulsion

converters in good time. ABB had to embark an engineer at sea in order to complete the commissioning in one case. With ship builder, owner has now agreed that the propulsion drives are set-up during the first sea trial, with no putting this back to the second trial unless there is a serious technical issue. In this case the default would then be a higher level of manning, in order to complete the commissioning even in the face of further problems. Indeed ship builder threatened to charge ABB the cost of addition days at sea for any repeat of the performance.

Owner has agreed with ship builder, the ABB conduct further analysis of the problems encountered on propulsion converter set-up, such that ABB are better informed of the technical difficulties in combining a real electrical machine and the converter control system.

Important activities are provided by third party technicians such as Sija (Slovenia). There have been issues with related activities during commissioning – for example delayed sailing on delivery of vessel due to programming of the Relion IED, FRER switchboard transducer set-up on sea trails, and AVR setup on sea trials.

It is accepted that ABB will look to reduce manpower costs, and provide local manpower for long term projects. However it is necessary that ABB Marine engineers maintain proper oversight, not only to avoid mistakes, but ensure more consistent engineering between regions and ship yards. ABB is an equipment supplier; however for marine is also the integrator. Shipyards are not always comfortable with this large influence.

ABB Marine have had some difficulty obtaining support from the drives business unit (Switzerland) for the propulsion converters (perception). Commissioning has often been problematic, particularly in obtaining proper back-office support during sea trials over the weekend. Shipyard has taken measures to improve this at owner request.

RCS system should be more flexible. Price should include changes “tailoring” in the design phase. There is a lot of red tape if an extra cost of ~10k€ needs to be approved by the customer management. This should be handled other way in a multi-million euro contract. The customer has a fixed price with the shipyard and it’s difficult to get more money for things that they thought they already payed. Customer wants more pre-contract meetings where more details are locked and specified already between Shipyard – Customer – Case company.

Shipyard tends to finish the design with ABB before it is approved with the customer creating unnecessary re-work. There has been problems as the shipyard does not

share all the ABB documents with the customer. ABB should take care of the protections of its own equipment and critical functionalities like the blackout prevention as ABB has the expertise and fast network. ABB should have a better process on what engineering to be done in what stage of the project. What is done at the component factory, What is done on the ABB factory, What is done on site in harbor, What is done at sea trial.

Case company Interview field notes

Informant: Technical sales support representative 1
Interview duration 60 min.

Sales support goes directly to (tier2 customer) ship owner to present new ABB technology solutions. All the ship owners are stressed about the emission reduction directives/regulations and are very interested about new solutions like batteries, fuel cells etc.. At the moment all shipyards are well booked and it's "builder's market". Shipyards are then very reluctant to increase their risk with new novel deigns and reject many of the owner's requests. Owner will at the end pay a fixed amount and shipyard carries the risk to complete the vessel according to specification. New technology is also difficult to sell because the risk reservations are carried by the first project and selling price is very high.

New ABB products do not always fit well to the existing product portfolio. All products have their own R&D. The entire process is not managed e.g Azipod M power rating compatibility with suitable product Drive.Data gathered from the Remote Diagnostics is used in sell efforts. ABB sells RDS to customers with minimum price or free (licenses included for one year).

New shipyard tends to request for a larger ABB package (Azipod+ Drives+ MSB+ Transformers+ Powerplant). Large shipyards whom have cooperated with ABB for a long time want to get savings by breaking the ABB package to smaller parts as they have noticed how to do the integration of simple equipment's like transformers. With the simple equipment ABB sells products, not solutions. Large customer has already chosen "to teach ABB a lesson" by giving one big order to a competitor (Wärtsilä). ABB has been seen as arrogant player.

First ABB usually gives preliminary equipment dimensions to consulting companies who prepare the general layout and basic design. Later a package is offered to multiple shipyards. Once a shipyard has a contract more detailed negotiations are held with the shipyard and deviations are marked. ABB sells with the promise that we have the knowhow to complete the project and take ownewship of the technical execution of the solution.

Sales support have also poor information about the new product generations as the projects are sold with the delivery date ~five years away. Reservations for the next

generation equipment has to be written to the specification, when the production factory does not even know the new product details.

Informant: Sales manager 1 **Interview duration 70 min.**

ABB is well known in the Market and does not need to prepare a detailed product advertising for the “regular” customers. ABB sells with ROI calculations based on Azipod fuel efficiency and powerplant optimization. Operational savings are demonstrated also with gathered RDS data combined with vessel operation simulators. Customers are invited and the superior maneuverability of the Azipod is demonstrated via the simulator in a real Harbor environment where the vessel would operate time, fuel cost and efficiency savings are calculated and presented. One more selling point is the ABB service network which cover the whole planet. Resources are available close to many ports around the world.

Diesel electric powerplant benefits are compared to traditional mechanical shaft line system. Diesel-electric powerplant is dimensioned to run constantly on the optimum operational areas. We do not advertise a specific product. Informant would see a need for a product-based differentiation guideline. We are the Market leaders in diesel-electric solutions and remain a good position due to good references and good relationships to vessel owners. Unfortunately, most of our selling points are directed to the owner. Shipyard does not care about the operational savings. They care about the production savings. Many shipyards have their own preferred solution integrators.

In general ABB can offer many benefits as a system supplier & integrator. ABB provides a common alarm and events system. All sub-systems are supplied by the same vendor and are under 24/7 support during the warranty and over lifetime. ABB Integrated system can support the novel technologies leading to lower operational costs. Guaranteed proper operation of the Azipods i.e. ABB is limiting in many places the areas of restricted operation (forbidden angles etc.). RDS is able to collect information from all systems from bridge to propeller. These benefits have not been so far expressed directly as money or time savings. This would be beneficial especially with the new smaller shipyards. There are only very small efficiency differences between electric equipment (ours versus competitors) when compared to the efficiency benefits from a well-balanced and managed power plant.

In some cases, the shipyard has taken the quotation materials and then purchased the components separately without integration or Marine warranty. In the beginning of the

project money talks and bullshit walks. Software solution e.g. PCS/ RCS/ RDS are not always considered properly by the shipyard. Value is seen on the hardware.

In the last five years the emission targets are one of the biggest talking points on the market as the ships have a long lifetime and needs to fulfill regulations which are getting stricter every year. ABB has a very good brand image on new clean technology and fuel-efficient solutions. ABB arguments are respected in new technology. Customer (vessel owner) wants to hear about the new solutions. Price is not seen as an obstacle on the novel technology by the vessel owner. Certainty of project execution is key.

Vessel basic design is prepared by a design/consulting company. This is where the ABB selling work already begins. ABB has established contacts to the consulting companies, whom are in contact with ABB in regard to new available zero emission technology, ABB solution dimensions and consumption etc. When the vessel basic design is already preparing to the owner with ABB dimensions and technology in mind, we are already one step ahead. Next our key customer specific sells managers visit the vessel owners and sell the fuel savings, operation efficiency and integration benefits to get ABB specifications strongly to the vessel specification which the shipyard needs to follow. In the end the shipyard usually makes the decision on the equipment suppliers pending owner approval. If lower price supplier is preferred by the shipyard justifications & compensations are negotiated by vessel owners and shipyard. The biggest shortfall in ABB selling is the benefits for tier 1 customer. Most of the ABB ES products are sold as solutions. Even thought the consultative selling has been done for a vessel series and not for each vessel separately.

Informant: Sales manager 2 Interview duration 40 min.

ABB solutions are sold usually after the Azipod has been sold to the customer. Although there are some similar (to Azipod) solutions available from competitors, none have the track record and references as ABB Azipod. ABB has close to 100% of the podded propulsion market. After the Azipod has been sold the rest of the system covering minimum the propulsion transformer and Drive are sold as owner refuses to split the maintenance and support responsibility. If the propulsion stops working, they have one phone number to call. They do not need to start the discussion who is at fault. Premium is placed on the operation certainty in case of system failures. Azipod installation time and space savings are beneficial to shipyard. Once one Azipod is sold to a shipyard it's much easier to get the next contract as the customer knows the work process and design already. When compared to shaft-line there are multiple benefits from less gears, and mechanical parts to break and maintain. Siemens for example has won one podded propulsion contract which has not been in the news for a while. Speculation is that there are some major technical problems as their milestone project has gone silent.

Some large shipyards have their own vessel equipment integration department. There is increasing pressure from the shipyard to breakdown the ABB scope of supply and do the integration in-house. So far ABB has managed to convince the vessel owner to keep the ABB scope and integration by raising the service issue. e.g. if a switchboard is bought from a small Italian manufacturer and there is a fault on sea, the supplier has only one service location in the middle of Italy with poor availability to make rapid repairs on sea while the vessel is operating or docked e.g. in Miami.

ABB is the front runner in many of the new technologies e.g. in zero emission. ABB is seen as credible partner in new technology as ABB green values are in the core of ABB brand. ABB Marine is a system integrator. There is no business case in selling components. ABB factories can do that them self. ABB Marine has to deliver the solution which is the best fit for the vessel type and design. Transformers are usually the first ones to be dropped from ABB scope as they do not create additional value in ABB system (only added value from the maintenance network).

In the system integration ABB guarantees that all the components work together as a complete system (one stop shop). New solutions and changes are difficult to be sold to shipyards as there is already established ways of designing a system and copying from previous vessel is the cheapest way for the shipyard. There has been some new situa-

tions where the vessel owner has requested a three way negotiations pre-contract between ABB, shipyard and vessel owner in order to have their say in the technology used in the vessel. This gives ABB a good additional advantage. Owner gets what they want without tens of ‘change-orders’.

ABB sales negotiates with the customers (tier 1) and influences the vessel owner specification (tier 2). Purchasing get quotation from ABB factories and bundles multiple vessel equipment orders in order to get the best possible price. Each main equipment has a dedicated purchaser in order to stay on top of the price level and special requirements.

Informant: Technical sales support representative 2
Interview duration 40 min.

ABB integration means responsibility of the successful delivery and commissioning of the entire ship system including multiple ABB equipment integrated together. System support and maintenance continues throughout the lifetime of the vessel with Remote Diagnostic system and maintenance agreement. RDS is always included in the scope. One year of diagnostic support (help for staff and continuous online monitoring). All services are provided through a single point contact. One contract during projects and another after delivery.

ABB provides risk reduction to owner. There is a vessel owner CVP based on vessel type. For cruise vessels ABB sold as a large reliable supplier. For simple ferries a cost-effective standardized solution are offered. For all customer ABB offers a single point contact for support in order to make communication effortless and support fast.

New technologies are seen as a benefit for ABB as a smaller suppliers don’t have the required engineering resources to reassure the owner of a successful system delivery. ABB is seen as the safe option. ABB has the financial packing to finish the project even if there are problems. At the moment new technology like the fuel cells are now designed with smaller shipyards whom want to differentiate.

ABB always aims to sell a solution. For the established large shipyards, the solution has been agreed per vessel type or ship series. Co-created solution is developed usually for the new technologies and Azipod operation. There ABB simulate different operation conditions and prepares studies of the fuel savings, ROI, etc.. Once a relationship

has been established through value co-creation there is some good will in the biding process. Especially on the smaller shipyards.

ABB integration brings a single contact person and life cycle management of the ABB systems via RDS. For shipyard there is less risks as ABB takes care of the interfaces. All ABB systems are connected together via redundant, failure resistance control network. There is dedicate sales manages for design houses and ship owners and separate sales managers for shipyards. ABB provides same quotations for many shipyards. Shipyards are contacted after a few weeks if there is no contact. ABB also provides suggestions and consultative selling for new players on the vessel type sector advising on the solution they should purchase (by means of system single line drawings). After a while one shipyard emerges as contract winner and firm contract is negotiated. Service department is advised to offer owner service agreements etc. Purchasing negotiates binding process after the specification is agreed with the shipyard. If there is a need for a need for customization deviations are negotiated with the manufacturing factories. Once there is a RFQ (request for quotation) sales support is included to the sales team.

Case company work group Minutes of Meeting

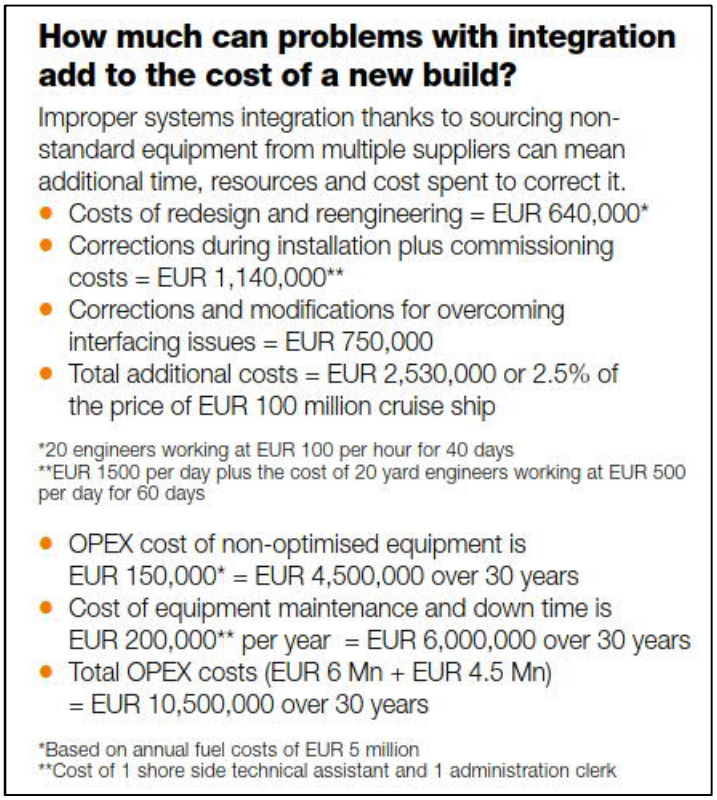
Participants:
3 x Lead Engineers (LE1, LE2, LE3)
1 x Engineering Manager (EM)
1 x Author (LE4)

Time: 19.3.2020 klo 13:00

Place: Skype video conference (due to Corona virus quarantine actions)

Meeting starts 13:05 as all participants have joint the meeting. Meeting starts with a topic (PowerPoint) presentation via by the Author. Presentation ends with the Appendix 4 drawing of the identified case company current state analysis weaknesses. Appendix 4 also provides structure for the discussion as it presents the three categories of information (ABB solution development actions, resulting new customer benefits and benefit communication method) expected to be derived from the work group. Author continues by describing each of the weaknesses presented and provides justifications for the weakness selection. Participants are encouraged to interrupt at any time if questions or comments.

After weakness presentation each of the work group meeting members voiced their opinion on what would be the most important ones for development. "Changes in preliminary equipment dimensions" and "load balance calculations" were seen as the least important to develop and were decided not to be developed in this work group. Although these weaknesses were seen to cause problems (LE1 & LE2 gave examples from current projects) the work group could not identify tangible actions that could be taken to fix the issues to satisfaction. Problems in load balance calculations were seen (EM) as a



problem largely related to unexperienced shipyards entering to a new sector (e.g. cruise vessels). These calculations are quite far away from the case company departments work area (EM).

Monetary value of integration benefits was seen as “nice to have” in the sales documentation as the competitors are also pushing their truth (EM+LE1). There is so little tangible benefits presented at the moment that all the provided calculated facts are seen as great value (LE1+LE2). Calculation should be done by the sales support team based on savings on: design hours (€/h), I/O savings (€), etc.. Costs from previous projects and estimations. e.g. Wärtsilä does “bold” calculations (see figure on right. facts from figure presented in the meeting) (LE4).
“Missing upper level principle drawings” weakness was seen by all the work group participant as the most important issue to fix. One of the LE3 noted that he has already prepared and supplied these drawings for one customer due to pressure from the customer. LE1+LE2 noted that the existing drawings would be an excellent starting point for the solution development. One set of principle drawings (one per system) should be prepared for the sales support department (LE4). These drawings should be used to explain the case company standard solutions to the customer (LE4). Document is tailor made in basic engineering phase as project specific (and included to the standard delivery documents) (EM). The higher level principle drawing provides clarity to the case company solution and helps the customer to comment the solution functionality (LE3+LE4). Drawing will provide benefits also in explaining the integration benefits e.g. in reduced HW communication (EM+LE4).

“Supplier to control and protect aux. systems” weakness was seen as the most difficult to solve in a cost-effective manner which supports the customer needs. Entirely new dual controller powered PLC solution was seen as too expensive solution as the price would be many times higher that the current method (protection through Automation) (EM+LE4). Although technically this would be the superior solution. After a long discussion a solution emerged in the form of modular power distribution solution including a few optional parts in addition to the current scope. Option 1 would include all auxiliary motor starters needed for case company devices. Option requires independent small cabinets or MCC or integration of starter in the equipment by the manufacturing factory (LE1+LE3+LE4). Option 2 would include the control of all auxiliary devices. This option has also been already done for one customer (LE3). LE3 stated that this option is not

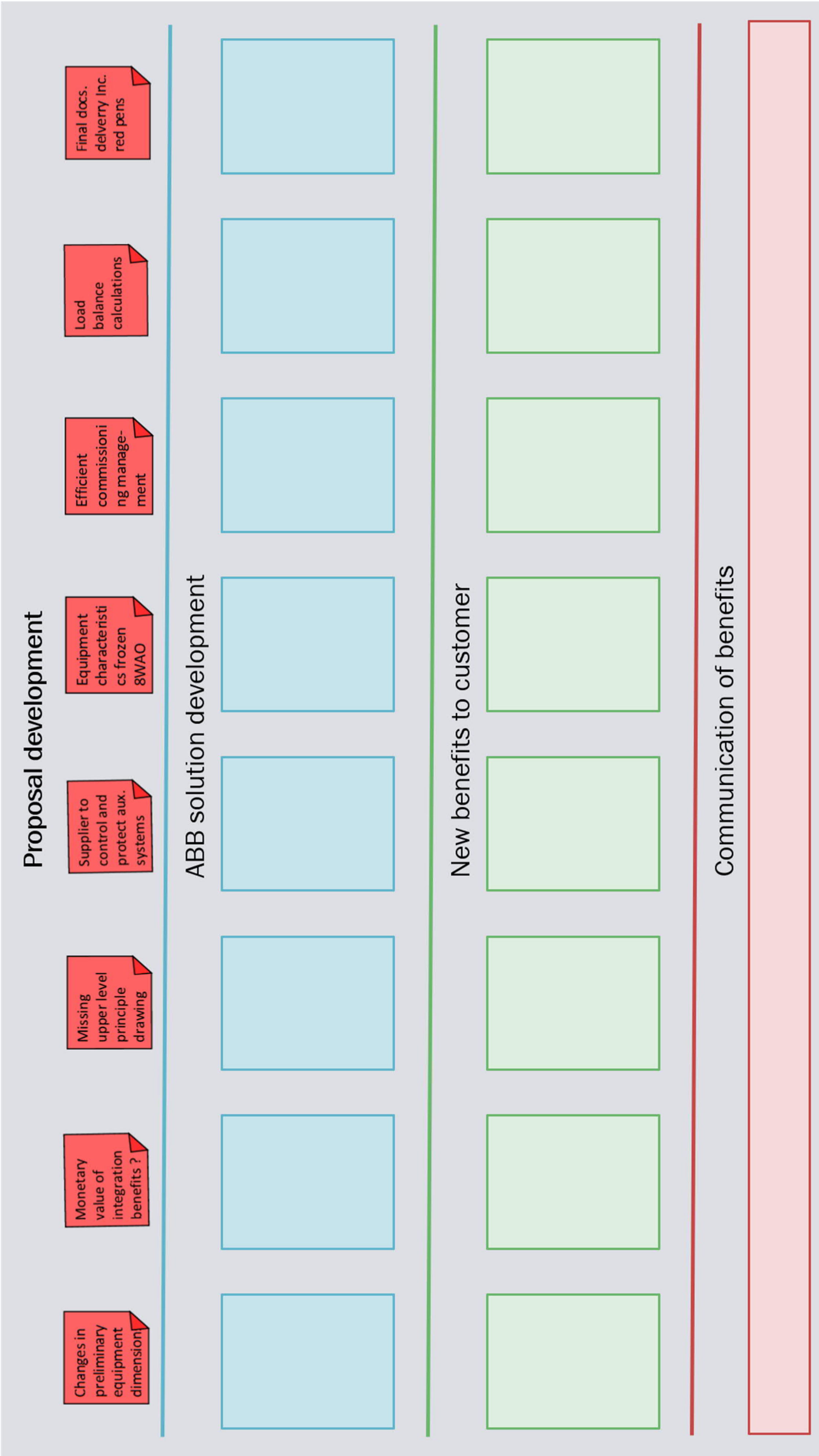
that difficult to execute. Control signals were taken from the PCU as remote ACS500 I/O installed in the shipyards MCC. Option 3 would include independent critical device protection. In this option one set of temperature measurements per consumer is directly hardwired from consumer to MSB protection relay (LE1+LE2+LE3+LE4). Solution enables the safe operation of the equipment even if the automation is down. Solution provides the fastest and most reliable protection of the equipment as there is no signal processing and I/O cards between (LE4). Suitable MSB relays need to be chosen for the solutions (Relion 640?) (EM).

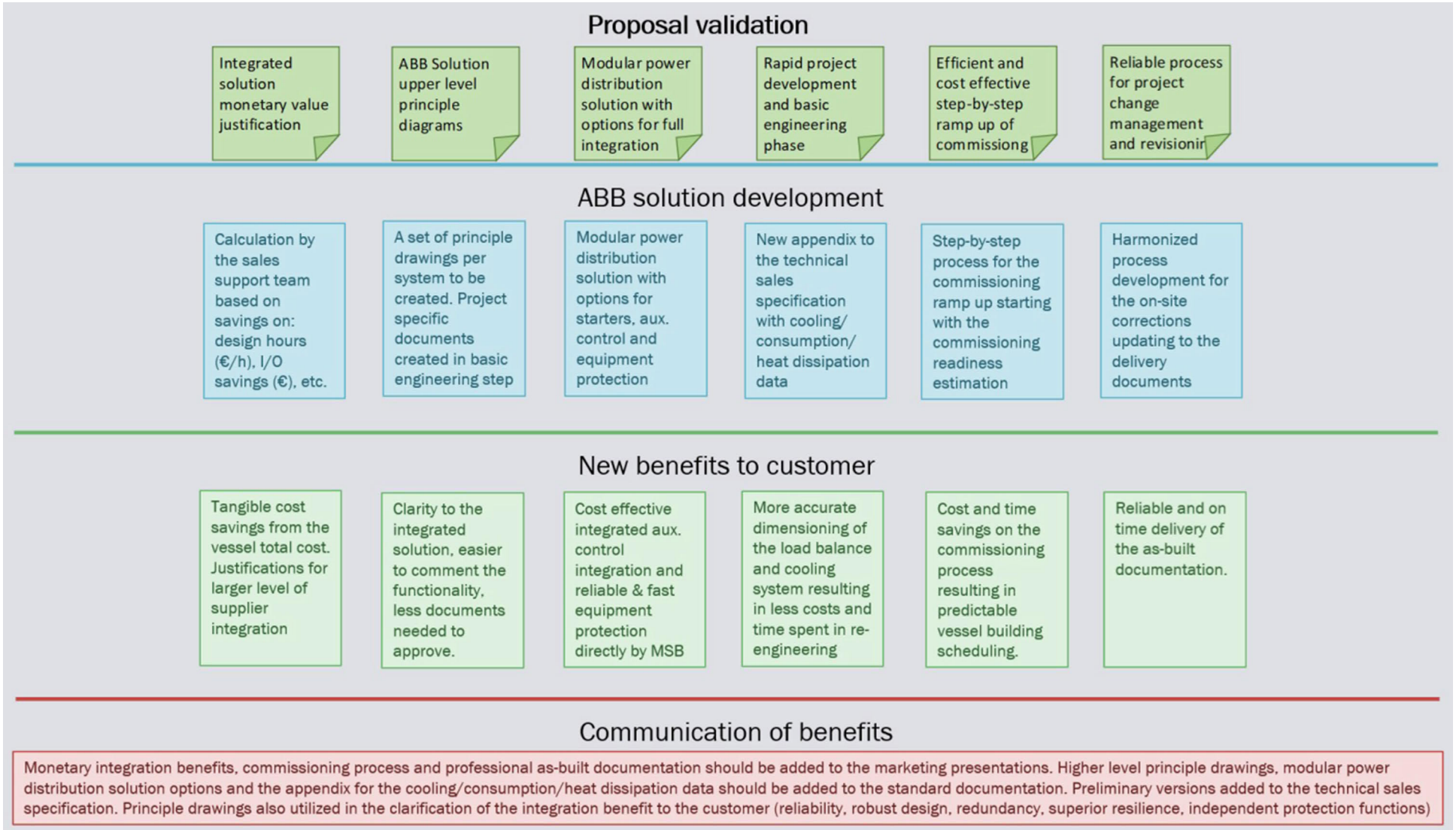
“Equipment characteristics frozen 8 WAO” weakness is one of the major pains when the shipyard is doing the cooling dimensioning of the vessel (EM).Document delivery 8 weeks after order has been also requested by many shipyards (LE1+LE2). There is a scheduling difficulty as the requested data is available only after manufacturing factories detailed design (LE4). It was noted that the data does not change that much from project to project (EM+LE3+LE4). It should be possible to get an approximated value from the factories. In order to meet the 8WAO deadline the information should be included already on the case company sales specification (Appendix) (EM+LE3+LE4). Some of the data is already scattered around the specification. Data should be consentrated to one appendix in the end of the tech. spec. (work for sales support) (EM). Data is directly copied to the project documentation and revised once project is developed. Template needs to be agreed between stakeholders (EM+LE4).

“Efficient commissioning management” is already a priority with the case company management (EM+LE4). There is a lot of pressure to cut costs. There is already a ongoing process to bring transparency to the process with checklist filled by the commissioning engineers (EM+LE3). Additional actions were discussed in the work group. Precommissioning checks asked from the shipyard do not work as the shipyard is not willing to follow the procedure (LE3). This item was commented also by a customer in the CSA. There was a suggestion to send one commissioning engineer to prepare a readiness evaluation before the commissioning team is sent to the site (LE4). Engineer sent to the site would then prepare a report detailing the actions that needs to be done by the shipyard before the commissioning team is sent to the site. Commissioning should be started step by step as the equipment is ready for commissioning. This is an effort to reduce down-time and increase the total efficiency resulting in cut costs. Shipyard

will see benefits in reduced commissioning price and time spent working on the harbor. (EM+LE2+LE4)

“Final doc. delivery inc red pens” weakness refers to the time cap between the sea trial and the delivery time of the as-built documents containing all the modifications done in commissioning (LE4). This is largely a process issue. There is not an agreed common way of getting the on-site-feedback back to the office and then applied to the drawings (LE3+LE4). At this point the manufacturing factory has very little inters anymore do to any work for the project (LE3). Documents and equipment from the factory are delivered and payment received (LE3). Conclusion of the discussion was that there should be a named person responsible at the site for the delivery of all red pen corrections to the Lead Engineer at the office. As a default this named person should be the site manager. As Lead Engineer receives the update, he should without delay delegate the document revision work for a project engineer. As revised document is available it is uploaded to the electronic document filing system by the document controller. As-built documents are finally published in one set right after the sea trial. The division of the work is one of the keys to success as these changes may be otherwise lost in the Lead Engineers work queue (LE1+LE3+LE4).


Proposal development
Changes in preliminary equipment dimension
Monetary value of integration benefits ?
Missing upper level principle drawing
Supplier to control and protect aux. systems
Equipment characteristi cs frozen 8WAO
Efficient commissioni ng manage-ment
Load balance calculations
Final docs. delvery Inc. red pens
ABB solution development
New benefits to customer
Communication of benefits


Proposal validation
Integrated solution monetary value justification
ABB Solution upper level principle diagrams
Modular power distribution solution with options for full integration
Rapid project development and basic engineering phase
Efficient and cost effective step-by-step ramp up of commissiong
Reliable process for project change management and revisionir
ABB solution development
Calculation by the sales support team based on savings on: design hours (€/h), I/O savings (€), etc.
A set of principle drawings per system to be created. Project specific documents created in basic engineering step
Modular power distribution solution with options for starters, aux. control and equipment protection
New appendix to the technical sales specification with cooling/ consumption/ heat dissipation data
Step-by-step process for the commissioning ramp up starting with the commissioning readiness estimation
Harmonized process development for the on-site corrections updating to the delivery documents
New benefits to customer
Tangible cost savings from the vessel total cost. Justifications for larger level of supplier integration
Clarity to the integrated solution, easier to comment the functionality, less documents needed to approve.
Cost effective integrated aux. control integration and reliable & fast equipment protection directly by MSB
More accurate dimensioning of the load balance and cooling system resulting in less costs and time spent in re-engineering
Cost and time savings on the commissioning process resulting in predictable vessel building scheduling.
Reliable and on time delivery of the as-built documentation.
Communication of benefits
Monetary integration benefits, commissioning process and professional as-built documentation should be added to the marketing presentations. Higher level principle drawings, modular power distribution solution options and the appendix for the cooling/consumption/heat dissipation data should be added to the standard documentation. Preliminary versions added to the technical sales specification. Principle drawings also utilized in the clarification of the integration benefit to the customer (reliability, robust design, redundancy, superior resilience, independent protection functions)

From the customer feedback following critical issues were raised up for development:

1. Vague monetary benefits of the ABB integration
2. Too many approval documents, unclear functionality of ABB solutions
3. Unclear limit of system delivery. Integration of auxiliary device starter delivery and control preferred.
4. Input data for cooling dimensioning and load balance calculations arrive too late (8 week after order preferred).
5. Commissioning needs to be made more efficient. Time and cost savings are needed.
6. Red pen corrections from site to as-built documents is lacking quality and efficiency.

Following corrective development actions are considered:

1. Vague monetary benefits of the ABB integration
   → Calculation by the sales support team based on savings on: design hours (€/h), I/O savings (€), etc.

2. Too many approval documents, unclear functionality of ABB solutions
   → A set of upper level solution principle drawings per system to be created describing the communication between ABB equipment. One drawing per system.

3. Unclear limit of system delivery. Integration of auxiliary device starter delivery and control preferred.
   → Modular power distribution solution with options for starters, aux. control and equipment protection.
   Option 1: ABB provides all auxiliary motor starter for ABB devices.
   Option 2: ABB provides the control all ABB auxiliary devices
   Option 3: ABB provides independent thermal protection of devices connected to the MV-MSB. A set of PT-100 directly connected to the MV-MSB protection relay. Independent from all external systems.

4. Input data for cooling dimensioning and load balance calculations arrive too late (8 week after order preferred).
   ➔ New appendix to the technical sales specification with cooling/ consumption/ heat dissipation data. Data revised as needed 8 weeks after order.

5. Commissioning needs to be made more efficient. Time and cost savings are needed.
   ➔ Step-by-step process for the commissioning ramp up starting with the commissioning readiness estimation prepared by a ABB Engineer.
   ABB Engineer provides the shipyard a report detailing the actions to be taken before a system can be commissioned (system by system).
   Commissioning team is sent to the site as needed (step-by-step) once the vessel is ready for commissioning of different equipment's.

6. Red pen corrections from site to as-built documents is lacking quality and efficiency.
   ➔ Harmonized process is developed for the on-site corrections updating to the delivery documents.

ABB Site manager will collect all red pen updates from the commissioning team and sends corrections to the project Lead Engineer.
Lead Engineer immediately sends document for yard information and delegates the document correction and revision work for a project engineer.
Document controller updates the electrical documentation achieve.
As-built documents (with correction implemented and documents revised) are published to yard in one complete set immediately after sea trial.

Could you please provide comments or suggestions for any of the items?

All feedback is welcome.