

Prosjektoppgave ved Handelshøyskolen BI

- How to reduce delivery time while
keeping sufficient technological
flexibility- case study of Ulstein Verft AS-

Eksamenskode og navn:

MAN 26191 – Supply Chain Management

NB: Denne oppgaven er IKKE skrevet på avsluttende Master og Management
program.

Utleveringsdato:
25.09.2012

Innleveringsdato:
15.05.2013

Stuedsted:
BI Oslo

Introduction

This thesis is written as a part of Executive Master of Management Program in Supply Chain Management at Handelshøgskolen BI, Oslo.

Topic for the thesis has been chosen in cooperation with Ulstein Verft's Director of Operations and professor Göran Persson.

Mr. John Sølvsberg has been helpful with his advice within process improvement.

We would wish to thank Mr. Harald Møller, Mr. Håvard Stave and Mr. Roar Rise with his New-Build 295 Project Team at Ulstein Verft AS and Mr. Runar Muren and Mr. Lars Ståle Skoge at Ulstein Design and Solutions AS for sharing their experience and for their useful input and contributions.

We would also like to thank Mr. Raymond Johnsen, General manager at NCE NODE Incubator AS and Mrs. Hilde Borgen, Procurement Manager, Fast track subsea tie-in projects at Statoil Petroleum AS for inspiration.

Summary

The goal of this thesis is to discuss what can be done in the sales phase to reduce delivery times while still keeping necessary flexibility of technological solutions.

Although Ulstein Verft has elements of Value chain, we have defined it as mainly a Value shop. The reason for this is that Ulstein is building highly specialized and customized ships, relying on highly competent personnel to find the right solution to customers need.

As a theoretical framework we have mainly studied SCM theory concerning value creation and collaboration.

In our research we have used qualitative techniques, where data has been collected through interviews, observations and workshops together with examination of existing procedures.

Though our hope was to contribute to re-design of shipyards sales process, we concluded that it is not the sales process itself, but focus on continuous learning through interaction and collaboration that will increase both customer's value and shipyard's effectiveness through economy of scale and innovation.

RESEARCH BACKGROUND	3
1.1 COMPANY BACKGROUND	3
1.2 DESCRIPTION OF THE ENVIRONMENT OF SHIPBUILDING PROJECTS	3
2 RESEARCH PROBLEM, LIMITATIONS AND GAINS	4
3 RESEARCH METHOD.....	6
3.1 DATA COLLECTION METHODS	6
3.2 RESEARCH DESIGN.....	6
4 THEORY REVIEW	8
4.1 WHERE DOES VALUE CREATION TAKES PLACE? KEY CHARACTERISTICS OF VALUE WORKSHOP.....	8
4.2 WHAT IS A GOOD DELIVERY PROCESS?	10
4.3 SUFFICIENT FLEXIBILITY – WHERE DOES THE VALUE FOR THE CUSTOMER COME FROM? ...	12
4.4 WHO ARE CENTRAL ACTORS/ROLES IN CORE BUSINESS PROCESS?	12
5 EMPIRICAL DATA	13
6 ANALYSIS.....	14
6.1 WHERE DOES THE VALUE FOR THE CUSTOMER COME FROM?	14
6.2 WHAT DESCRIBES A GOOD PERFORMANCE PROCESS?	15
6.3 COLLABORATION WITH SUPPLIERS AND SUB SUPPLIERS.	18
6.4 WHO ARE CENTRAL ACTORS?	19
7 CONCLUSIONS.....	20

Research background

1.1 Company Background

Ulstein Verft AS (hereafter called Ulstein) is a shipyard on the west coast of Norway. Ulstein builds advanced special-purpose vessels such as offshore support, offshore construction, seismic and well intervention vessels. Shipyard possesses unique expertise in engineering, installation, commissioning and upgrading and has strong focus on innovative technological solutions and methods. Its dedicated workforce together with streamlined production processes has in many years resulted in a high level of flexibility and quality.

Ulstein's stakeholders require continuous focus on development of modern and dynamic organization, improvement of shipbuilding process, productivity, good flow and project management. Furthermore, Ulstein shall work with marked leaders within its business area – both upstream and downstream. Its aim is to continuously focus on and develop innovative technological solutions and methods, project management expertise, efficient logistics and vessel outfitting methods – thereby creating value for its customers.

1.2 Description of the environment of shipbuilding projects

Shipyards customers, both directly and indirectly are shipowners, offshore operating companies and oil-production companies. Ulstein customers are often market leaders within their business area. These companies' aim is to create value in the market that is depending on fluctuant oil prices, increasing international environmental requirements, financing requirements, high operating costs and where vessels are to be in operations as planned, and as scheduled. Shipyards customers' main focus is therefore safety at sea, continuity of operations, shorter delivery times and cost reduction.

Due to the volatile and changing requirements, flexible and innovative technical solutions are necessary both in pre-sales phase of the shipbuilding project, and during project execution. Adjustments in scope of delivery might be related to the type of equipment in general, or to its capacity and interface with other equipment or systems. These adjustments are often crucial in order to fit vessel and its equipment to market's / customers/ oil companies current requirements. In many

cases ship-owners choose to build vessel without definite contract with end-user, based either on the estimated demand in the market need or on the discussions on potential development projects with potential end-users.

Customers are aware of that adjustments ‘‘along the road’’ might easily influence both project cost and its delivery time.

Although cost might be a subject for discussion, postponement of vessel delivery however shall not, as it easily triggers more severe consequences.

Keeping the delivery time on track means that vessel is in operation as planned – and the vessel operating costs, including crew costs¹ are being covered for. It also means that ship-owners monthly fixed site-management cost² are is most likely as planned – which both are stabilizing ship-owner’s financing plan and cash budget for the project.

Vessel in operation as planned influences ship-owners and vessels reputation towards its customers, with regards to predictability and continuity of operations – customers are oil-production companies with huge organization and production stop due to any reason means enormous economic loss. If that was not enough, investing in shipbuilding projects is by investors considered risky business – the shorter exposure, the better. Postponed vessel delivery, including the above mentioned consequences, affects the share value for those participants of the project that are represented on the stock market.

2 Research problem, limitations and gains

Ulstein aims, as it is stipulated in 2011 Annual Report and confirmed in 2012 Annual Report, to deliver state-of-the-art ship design, maritime solutions and shipbuilding to market leaders within the business area of specialized offshore vessels. Ulstein’s competitive advantage has been the ability to deliver prototype vessels, where numbers of technical solutions are developed "along the road" – in short time, and on time. So far its customers have been willing to pay for this.

¹ Vessel operating expenses include crew wages and related costs, the cost of insurance, expenses relating to repairs and maintenance, the cost of spares and consumable stores, tonnage taxes and other miscellaneous expenses. (ex.costs of financing).

² Site-management cost is a cost of ship-owners organization set up at the shipyard site to follow up and supervise the shipbuilding project.

Recent experiences show however that the distance between Ulstein and its competitors when it comes to delivery times is melting alarmingly.

Ulstein is currently reviewing its ship-building model, including production's internal value chain. From the production point of view, there is a number of ship-building models, for example building the whole vessel on shipyard's site in Ulsteinvik, outsourcing production of hull and steel sections of the vessel at the cooperating shipyard in low cost country complete or partly outfitting with machines, piping- and electrical systems in low cost country, to building most of the vessel abroad. We are aware of that the way production activities are configured is an important element and presumption for study; though we are not analyzing these issues in detail. We choose to limit our study to the sales phase - a period from shipbuilding inquiry to the signing of the shipbuilding contract.

Each product, it being systems, components, service or as in our case; vessel features "double-faced nature" (Gadde, Håkansson and Persson 2011, 64). They spring from - and to - customers' needs and requirements in the usage contents, through production context.

In any development effort, also at the prototype shipyard, the collaboration and matching customers' usage requirements and shipyards production requirements are critical for value creation.

The goal of this thesis is to discuss what can be done in the sales phase to reduce delivery times while still keeping necessary flexibility of technological solutions.

For Ulstein shorter delivery times will not only mean keeping its competitive advantage in form of reliable, reduced exposure time. It will also allow the shipyard to reduce each project fixed monthly project management cost – since the project organization is finished earlier - and reduce project finance loan requirements.

3 Research Method

3.1 Data Collection methods

In our research we have used qualitative techniques, where data has been collected through interviews, observations and workshop, along with examination of existing procedures.

In order to understand and evaluate what we mean is the core business process, we used process mapping and process management techniques, including some of Rummel, Brache (1995) tools.

MS Office, including Word and Visio has been used to present the data as a starting point for workshop and interviews, and to generate the results of these.

3.2 Research Design

We have asked key sales- and project personnel in Ulstein and its sister company Ulstein Design & Solutions AS questions about customer value creation and required flexibility.

1. What is competitive advantage for oil companies? Can vessel fleet be a part of it?
2. What does oil companies experience as difficulties with regards to vessels?
3. Ship owners often define people as critical resources and keeping continuity of its activities as strategic. Which activities/functions of the vessels are critical? Is there any type of equipment that ship-owners are "more into"?
4. Do we know about ship owners' equipment portfolio strategy? Can this strategy give us possibilities? Or is it weakness? How?
5. Cost modeling: We know shipyards sales calculation model. Do we know ship owners' cost calculation? What are the main elements in the purchase cost - besides contract price for the vessel? What according to their experience is ratio of other cost elements to total cost of vessel acquisition?

Then, knowing which components and systems fall among flexibility required for customers' value creation, we asked participants of one of the recent shipbuilding projects to look at shipyards current sales and project execution process from the perspective of the delivered vessel.

We asked them to look at certain main and critical components, and consider the phase when the choice of technical solution has been made, how it influenced the choice of other systems and the delivery process, performed by both engineering and production.

1. During project execution there is strong focus on doing the job right according to specification and on time.

In retrospect, after the new-building project 295, specifically regarding main crane, propulsion system, and electro system. What went wrong? For example need for redrawing, interface problems, rework. Could any of this have been foreseen?

2. Did any of the equipment/ work delay other processes (bottlenecks)?
3. Did one have all relevant information?
4. Were there many changes during project execution?
5. Could any of this have been foreseen?
6. Consider the phase up until choice of supplier and solution for main crane, propulsion system, and electro system.
Did the "as is chart" match with reality?
7. Is it possible to give a time estimate on the different activities in order to identify where it is possible to gain time?
8. Can certain activities be performed in parallel instead of successively?
9. Which activities need to be finalized before the beginning of the next?
(bottlenecks)
10. Was the responsibility for interface between different activities and business units clearly identified, and was it handled effectively?

It was the original plan of ours to facilitate re-design of the sales phase in order to reduce delivery times.

4 Theory review

4.1 Where does value creation takes place? Key characteristics of value workshop.

One of the main design principles for reducing process time is to design workflow around value-adding activities (Madison 2005). So, what are those value adding activities then? Where does the value creation take place?

There are three generic value configuration models. These industry-dependent ways to describe value creation: value chain (Porter 1985), value network and value workshop might be used either alone or in combination with each other to decompose the firm into strategically important activities (Stabell and Fjeldstad 1998). Each model addresses value creation, interactive relationship logic, cost drivers, strategic resources along with primary and support activities (Huemer 2006). The clue in understanding the logic of value configuration – is realizing where the value creation for customers takes place. This provides foundation to the analysis of firm's competitive advantage and taking the consequences of that while shaping the firms strategy.

Value shops, according to Thompson (1967), 'rely on intensive technology' in order to solve clients problems. In this model supplier normally knows more than the customer, strategic resource is therefore right competence and the right composition of it. Consequently, leveraging of experienced personnel on the less experienced, training and mentoring is among substantial issues.

The sales process is mostly about understanding the customer's problem and the main value drive is reputation and experience (Stabell and Fjeldstad 1998).

Therefore right people at the right place both in the internal evaluation process and in interactions with potential customers are crucial (Merrow 2011).

The model is called 'workshop', as a contrary to chain, in order to emphasize the importance of coupling right solutions to right problems and configuring activities from case to case. This does not mean however, that none of the activities or issues could be dealt with by less specialized personnel or standardized solution. Understanding the customers' problems and requirements allows specialist to concentrate on right problems.

Primary activities in a value workshop are:

Problem identification - develop understanding of the problem/requirement

Problem solving - suggest possible solutions

Choice - choose techniques/ways to solve the problem

Execution/performance

Control/evaluation

Infrastructure
Human resource management
Technology development
Procurement

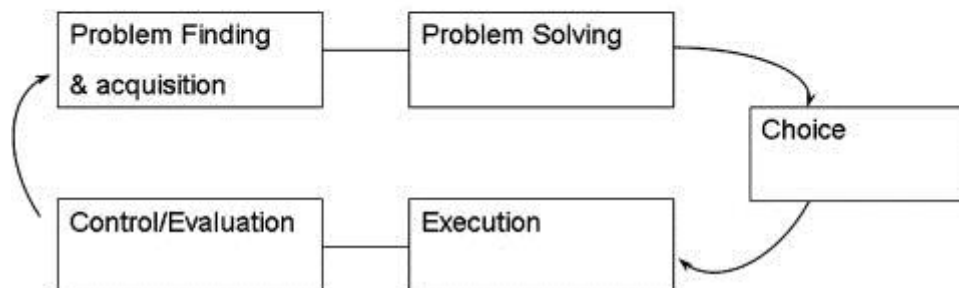


Fig.1. The value shop, source: Stabell and Fjeldstad 1998.

Understanding a complex issue requires varied expertise and collaboration between experts on different levels in organization and interplay with the problem owner. This collaboration might be project-organized or a part of line-organization, but it is often approached in the standardized way – in order to make sure that **all issues** have been evaluated – and should be motivated by wish to develop new and better solutions (Minu 2003) .

Finding possible solutions requires understanding the consequences of the choice both on other elements of the total solution and methods to execute these. One should use experience from similar issues, and plan the alternative solutions.

Choice of solution might both be a result of internal process and process between value workshop participants and its suppliers – resulting in a final offer. The final choice will always be a result of collaboration of the above with the customer.

Execution of the solution - Depending on the customer's choice will for Ulstein mean execution of the shipbuilding contract or execution of particular Change Order to the shipbuilding contract - both will require extensive collaboration.

Evaluation of the result: it meaning quality, performance, resource involved and used - though often neglected - is crucial as it contributes to better problem understanding, better alternatives, and better solutions in the future.

Activities in the value shop are cyclical since execution of the solution , which itself might as well be a generic supply chain model, might initiate new problems or reveal new solutions. Communication and continuous learning between specialists in spiraling activity circles are therefore important issues.

4.2 What is a good delivery process?

In Journal of Operations Management (2007) referred to in Håkansson and Persson's paper nr 62465 it is stated that because researchers in supply chain management have made limited use of organization theories, major opportunities exist to integrate insights from organization theory and supply chain management in order to build understanding of why some supply chains excel while others do not. There is a growing recognition of the importance of inter-organizational relationships as a source of competitive advantage and value creation.

Recent studies show that increased integration is taking place both within organizations, with suppliers and with customers and that this identifies and reduces costs throughout the supply chain.

Some researchers argue that basically firms are interested in how they can either significantly reduce product costs or add to what customers perceive as value-added benefits. Whether the strategic objective is cost reduction or e.g. improved delivery speed requires different forms of supplier relationship.

Recombining resources, both internal and external, can improve effectiveness and the supplier relationship represents the means for the integration between them Supplier relationships have multidimensional consequences, implying that suppliers can provide various forms of economic benefit;

economies of scale/scope:

by offering standardized solutions through which the buyer can share costs with other firms or by creating an assortment of supplies from specialized firms. Can be attained through distributive collaboration

economies of integration:

resulting in either complementary or closely complementary activities, depending on the extent of adjustments among the activities of buyer and supplier. Can be achieved through the linking of functions across a supply chain,

economies of innovation:

through problem solving, systematic adaptations of resources and activities, and mutual learning and teaching. (Gadde, Håkansson and Persson 2011)

Rummler, Brache (1995) points out the shortcomings of the traditional view of organizations, the vertical view, which often leads managers within an organization to look at other functions as enemies rather than partners. This view (the “Silo2 phenomenon”) prevent interdepartmental issues from being resolved between peers at low and middle levels and force managers to resolve lower-level issues and is not efficient. Instead of this vertical view of an organization one should view an organization horizontally including the customer, the product and the flow of work.

Efficiency improvement can be also reached by reconfiguring of activities and design workflow around value-adding activities (Madison 2005). It might often require standardizing, multiskilling, reduction of change-over and rework times and inspection/check points.

As Dan Madison (2005) suggests, the following ‘design principles for reducing process time:

- design workflow around value-adding activities
- organize by process³
- if inputs coming into the process naturally cluster, create a separate process for each cluster
- ensure a continuous flow of the "main sequence"
- reduce waiting, moving, and rework time
- reduce setup and change-over times
- reduce batch sizes
- substitute parallel for sequential processes
- reduce checks and reviews
- build quality to reduce inspection and rework
- involve as few people as possible performing the process
- ensure 100% quality at the beginning of the process
- increase flow and speed to identify bottlenecks

³ As also suggested by Rummel, Brache (1995)

- eliminate bottlenecks
- standardize procedures
- use co-located or networked teams for complex processes
- push decision making down to the lowest possible level
- use multi skilled people''
- standardize interface.

Those of the above mentioned principles, quite similar to the LEAN methodology⁴, that fit company's overall value configuration should be considered in re-design of the core process in order to reduce time.

4.3 Sufficient flexibility – where does the value for the customer come from?

Efficiency and flexibility in a way compete over a company's resources, the firm pursuing both will become stuck in the middle (Porter 1985) and suffer inferior performance. There are some models used to support process flexibility, mainly originating from automotive industry's need to increase flexibility in order to better match available capacities with customers' variable demands. We have been searching through the theory to find an answer to question what level of flexibility is sufficient. Unfortunately, there is not that much to find. Though number of authors (Chou, Teo and Zheng 2009 as well as Semchi-Levi and Wei 2012) support the idea that it is too expensive to maintain full flexibility and suggest sparse flexibility (Bassamboo, Randhawa and Van Mieghem 2012). Should the way to go be to be flexible when it is important enough for our customers - and then otherwise focus on efficiency (Tang and Wang 2010)? We decided that it would be best to ask Ulstein's sales personnel this question.

4.4 Who are central actors/roles in core business process?

Value shops rely on an intensive technology to solve a customer or client problem and the resources used will vary depending on the problem at hand. Although client problems often involve more or less standardized solutions, the value creation process is organized to deal with unique cases. This means that firms

⁴ LEAN methodology, introduced first by Womack, Jones and Roos (1995) has been developed and used in all industry. Dr Ing. Bo Terje Kaalsås uses the Lean Construction method and "Last planner" principle with good results in NYMO recently (Ellingsen and Fredriksen 2012).

with an intensive technology are labor intensive with professionals and specialists in the problem domain covered as the core and frequently the largest component of the workforce. Scale of operation beyond the collection of independently performing professionals is achieved by leveraging experienced senior professionals, both internal and external, with more junior and less experienced colleagues.

5 Empirical data

Interviews and documentation reviewed can be summarized as follows.

Ulstein is in the business of specialized offshore vessels where new technology is under continuous development. Equipment suppliers cooperate with shipowners and other actors in the industry in order to develop safer and more reliable solutions. Shipyards must also be a part of this development effort.

At Ulstein Group in general, it is Ulstein Design and Solutions AS that is responsible for the new technology development. At Ulstein Verft AS it is sales department and sourcing department that is to interact with both customers and suppliers on both problem-finding and searching for possible solutions.

Shipbuilding process is said to be complicated one. It includes a number of technology-, inter-face-, and project management and planning interdependencies. Therefore many interviewers state that shipyard's engineering department and production department should concentrate on efficient realization of the given project, instead of participating in "innovative processes" – though here being by many understood as new technical solutions rather than development of production techniques and project management excellence.

Personnel involved in the project realization points necessity to match customers requirements with the production requirements and underlines that there should be more focus on experiences with both new and already tested solutions: "If we only knew what we already know!" As mentioned by number of interviewers: failures, though detected and implemented in the current project, are most often not communicated within company's design/sales/sourcing. They also point that material cost calculation that is easier to measure in the early phase of the project, should be tighter connected with the projects' WBS⁵, as choices of equipment

⁵ Work Breakdown Structure (WBS) – called "Activity List" at Ulstein, describes and interconnects number of calculated engineering and production activities by using SFI Coding and

even minor assembling and commissioning included in delivery might have severe consequences on both activities directly related to the equipment⁶ and to the activities interconnected with these⁷.

Sales process from first inquiry to signed shipbuilding contract, though in fact in accordance with the attached business process (Fig.4), might take from four years to two weeks – most often depending on which phase of the investment process the shipowner is and the number of unclear requirements she or he has. As interviewers point, there are numbers of solutions, and consequences of these are either visible or non-visible for the customer. One thing however should be clear as sales personnel points it: everyone would like to have a choice – also shipowners - and presenting possible solutions and consequences of these in a proper way might make the choice easier of both the decision maker and other actors involved.

6 Analysis

6.1 Where does the value for the customer come from?

Understanding where the value creation for customers takes place provides foundation to the analysis of firm's competitive advantage and focus on the right activities. Ulstein's owners are quite clear in their strategy statement:

“Ulstein shall create value by solving problems and finding new solutions for shipowners and their customers and by adjusting its own activities for each problem-solving' execution.”

The value workshop model, which we claim Ulstein is, emphasize the importance of coupling right solutions to right problems and configuring activities from case to case. Understanding the customers' problems and requirements allows organization to concentrate on right problems.

Ulstein builds complicated tomorrow's technology vessels. These are designed and made to order – often ordered on speculation -and should fit a large number of functions and requirements from the potential charterer. The charterers aim to

Classification system and indication of vessel zone. Ulstein's planning department is coordinating sales WBS and each New-Build Project Planner is following up sales WBS vs actual status.

⁶ E.g. engineering interface towards electro, mounting, machining, assembling, commissioning.,

⁷ E.g. postponed engineering resulting in delay in delivery of hull, postponed painting of the hull or zone, postponed commissioning of the interconnected equipment, or even expanded sea-trial.

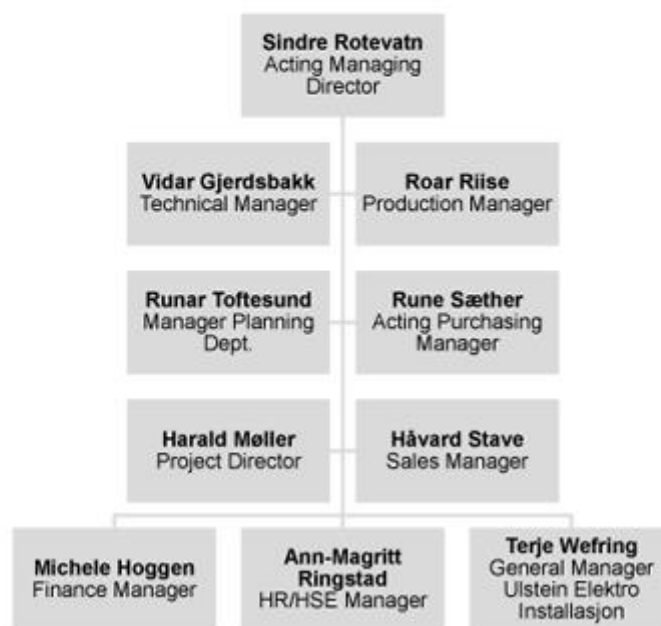
reduce the time of any given assignment. Their aim is also to perform assignments by using less number of vessels as it reduces the charterer's total project cost. Shipowners, when competing for certain projects add therefore additional and complementary functions and equipment to the vessel specification, to make the vessel more suitable for their customer. We are mainly talking about so called mission equipment, which also might have influence on other systems and the need of power – electricity. Changes in equipment and solutions require technological flexibility and flexibility of shipyard's operations – and take time. Shipowners find adjustments necessary and require general flexibility, but are only willing to pay - or wait for - the flexibility that gives them competitive advantage and influences their own value creation. Equipment and technical solutions that safeguard vessels' operations: maritime main equipment as thrusters and engines, dynamic positioning equipment; and mission equipment such as subsea, well intervention and cranes.

6.2 What describes a good performance process?

According to today's theory, Supply Chain management can be regarded as a network of connected and interdependent organizations mutually and cooperatively working together to control, manage and improve the flow of materials and information from suppliers to end-users. The implementation of Supply Chain Management for a focal organization involves identifying the supply chain members with whom it is crucial to link, what processes need to be linked with each of these key members, and what type/ level of integration applies to each link." (Håkansson and Persson) Because modern competition is being fought supply chain versus supply chain and not firm versus firm, means that the purpose of collaboration is to create an advantage within the market. In Ulstein's case it is to create new solutions together with shipowners and their customers, in order to make oil-companies' operations safer and more time-/ cost effective. Recent studies of supply management conclude that an increased integration is taking place within organizations, with suppliers and with customers. Thus supply managers should look for ways to facilitate and encourage collaboration and integration to enhance the value of product and service offerings, and to align activities to the correct place in the supply chain.

According to Rummler-Brache most managers, when asked to draw a picture of their business (be it an entire company, a business unit or a department) they typically draw something that looks like a traditional organization chart, showing the vertical reporting relationship of a series of functions. It does not show the customers, products or workflow, hence it doesn't show what they do, whom they do it for or how they do it.

MANAGEMENT TEAM SHIPBUILDING AREA



WWW.ULSTEIN.COM

TURNING VISIONS INTO REALITY

Fig.2 Management Team Ulstein Shipbuilding Area (Ulstein Verft AS and Ulstein Elektro Installasjon AS)

Some interviewees we have been talking, along with the Ulstein's power of authorization matrix imply that there is strict segmentation and silo-thinking of roles within Ulstein. However, searching for organizational chart for Ulstein, we find only current information about the Management team (Fig 2) and the reference to the quality system and reference to the Process Map for Ulstein (Fig. 3). This type of horizontal- or systems view of the internal organization with a reference to the external relationships has a number of advantages. It:

Includes the three missing ingredients from the traditional view; the customer, the product and the flow of work;

Enables us to see how work actually gets done, which is through processes that cut across functional boundaries;

Shows the internal customer-supplier relationship through which products and services are produced.

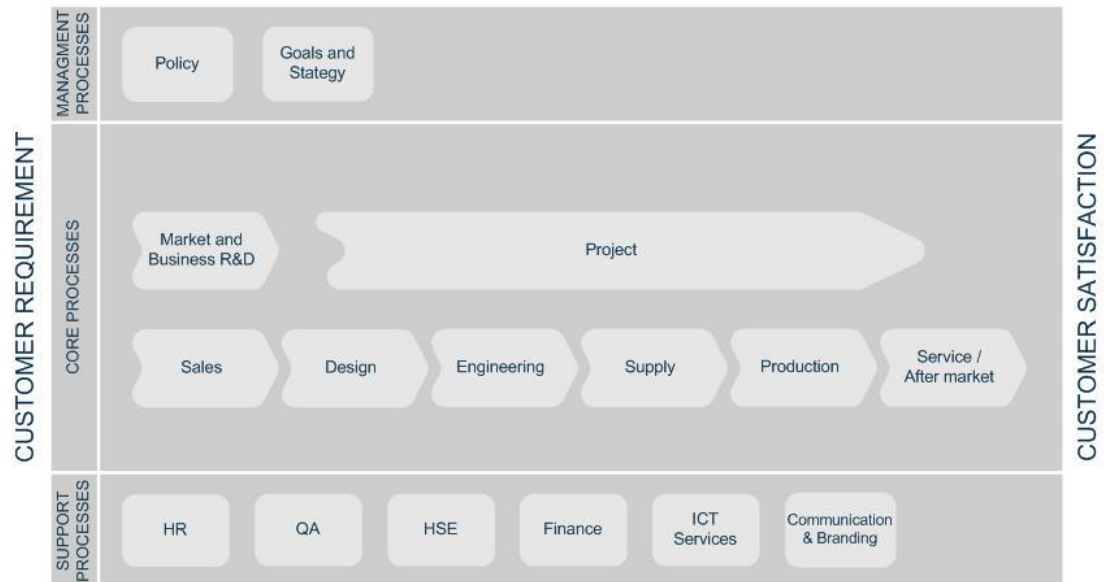


Fig. 3 Process Map for Ulstein Verft AS

According to Rummler-Brache the greatest opportunities for performance improvement often lie in the functional interfaces. The system view of an organization is the starting point- the foundation- for designing and managing organizations that respond effectively to the new reality of cutthroat competition and changing customer expectations.

Rummler-Brache have described an organization as an “ecosystem” where everything is connected. To improve organization and individual performance, one needs to understand these connections.

When asked what a good delivery process is, key project personnel at Ulstein, name effectiveness. They point at activities being performed as planned and goods and technical drawings being delivered from suppliers and from Ulstein’s own engineering department on schedule. Furthermore, having most of the operational requirements settled prior to shipbuilding contract – so the project organization can produce and execute, instead of spending time on interpretations and clarifications towards the shipowner and it’s customer. This allows earlier

start of engineering – both at Ulstein and at the suppliers engineering offices - and gives more time for engineering experts to come up with smart solutions and allow production to work as planned. And, good thought-through solutions reduce possibility for things to go wrong and reduce re-work for both engineering and production.

Key project personnel mentions short decision lines in both shipyards' and shipowners' project organization as an advantage. In the course of project execution, which itself is often characterized by sequential activities depending on each other, a number of problems might occur. These must be identified, solutions suggested, consequences analyzed and presented to the customer, decisions made and implemented - all without undue delay.

6.3 Collaboration with suppliers and sub suppliers.

It seems to be a common view in today theory that collaboration both within the organization and between the organization and its suppliers and customers, is a key to improve performance. Ulstein is experiencing that competitors can build complex ships faster and often cheaper than themselves. Theory points out that in order to reduce delivery time one has to seek some sort of standardization.

As mentioned earlier, standardization is not in line with Ulstein's strategy to deliver "state of the art" customized ships. We imply that standardizing those solutions that are less crucial for shipowners - e. g. pumps, valves, furnishing and accommodation, smaller cranes and other discharge solutions - would give possibilities for both larger purchasing volume (economies of scale) and reuse of technical solutions and largely also production drawings . Furthermore, the same effect might be reached by giving customers some choices of solutions to choose from, but keeping ends open and informing on consequences for price and delivery time. Ulstein uses 40 000 hours to draw a PSV⁸ for the first time. If we can get the same equipment next time we only need to update the drawings and will only need 2-3000 hours. If however, the supplier changes or modernizes the equipment, eg the steering system on a motor, our electro department has to check all cabling to see if it still fits. This will take us about 5-6000 hours. This means that we have to collaborate with the suppliers to ensure that they don't change anything unless it absolutely necessary or considered a great improvement. The

⁸ PSV is Platform Supply Vessel

point is to make things in a way that can be reused. Even if, for example the next vessel is twice the length but has the same machine room it can be automated. With the use of today's computer programs one can feed the correct variations and retract the right models. It could also be possible to feed DNVs' rules and regulations etc. This could lead us to use more of the same components which again could make it possible for suppliers to reduce their assortment.

Ulstein's sales process (Ulstein Verft's Sale Process, Fig4) is about finding the problem and presenting a solution. To make the delivery process as efficient as possible, key personnel points to the need of early evaluation of consequences of choices in the sales phase (before shipbuilding contract). The choice of solutions might influence other systems (system -interface), their performance criteria, class requirements, need for power, and time spent on mounting and commissioning. These issues should be assessed before decisions on equipment are made, customers' expectations settled, and before production schedule is settled. Experience tells us that personnel prefers equipment they know and with least possible interfaces. Another highlighted issue was that reduction of time requires more focus on suppliers' possible delivery times and that this should be settled early in the sales phase. Yet another contractual issue is that the shipbuilding contract doesn't have enough focus on how to handle "unknown issues." It is of course difficult to handle contractually what you don't know, but the contract should give some guidelines on how to proceed when unforeseen issues occurs. If main components were already settled and purchased before the shipbuilding contract is signed, engineering would be able to start collaboration with the supplier already straight after the shipbuilding contract is signed.

6.4 Who are central actors?

Asked who shall be involved in the sales process, key personnel points immediately at shipowner and suppliers – emphasizing the need of personnel with right qualifications and experience. Furthermore, members of the project organization point that in the ideal world production should be involved at earliest possible stage in order to evaluate technical solutions. In practice they do not have enough capacity to do that, and suggest that there should be enough shipbuilding-competence in the shipyard's sales-/supply organization to evaluate solutions.

Production might be involved from time to time during design review, which is at

the initiation of the problem finding; and take the feasibility check of final vessel arrangement – which is to be presented as a final offer to the customer. These comments confirm that an intensive technology to solve a customer or client problem and the resources used will vary depending on the problem at hand and that the best solutions and effective processes are achieved by leveraging experienced senior professionals, both internal, customers' and suppliers'.

7 Conclusions

The goal of this thesis was to discuss what can be done in the sales phase to reduce delivery times while still keeping necessary flexibility of technological solutions. Though our hope was to contribute to re-design of shipyards sales process, we conclude that it is not the sales process itself, but focus on continuous learning through interaction and collaboration that will increase both customer's value and shipyard's effectiveness.

In any development effort, also at the prototype shipyard, the collaboration and matching customers' usage requirements and shipyards production requirements are critical for focal company's value creation. This collaboration might be project-organized or a part of line-organization, but it should be motivated by wish to develop new and better solutions (Minu 2003). Value workshop theory explains how the value for customer is created by problem solving, not how problem solving enterprise shall be organized.

Value workshop requires analysis, management and development of knowledge and experience, as the value creation is in finding good and clever solutions and learning from mistakes (Argyris 1998).

As previously stated it is recognized today that inter-organizational relationships can be a source of competitive advantage and value creation and that proper focus on supplier relationship can lead to various forms of economic benefit.

Interviews with key personnel at Ulstein confirm that the shipyard could benefit from focusing on collaboration both intra-organizational and towards suppliers and customers. Ulstein is known for building advanced, customized ships with a high level of flexibility and quality. If customers no longer are willing to pay for or wait for this flexibility, one possible way forward is to give the customers the choice between a few predefined solutions. If Ulstein's costumers would accept a lower grade of flexibility in exchange for shorter delivery time both Ulstein and the costumer could benefit.

Reference list'

- Argyris C.1998.''Teaching smart people how to learn.'' *Harvard Business Review. Business Classics: Fifteen Key Concepts of Managerial Success*. Boston, Harvard Business School Publishing.
- Bassamboo A., Randhawa R.S., Van Mieghem J.A. 2012. ''A Little Flexibility Is All You Need: On the Asymptotic Value of Flexible Capacity in Parallel Queuing Systems.'' *Operations Research*, Vol. 60, No. 6, November–December 2012, 1423–1435.
- Chou M.C.,Chua G.A., Teo C. and Zheng H. 2009. Design for Process Flexibility: Efficiency of the Long Chain and Sparse Structure, *Operations Research* doi: 10.1287/opre.1080.0664.
- Ellingsen H. and Fredriksen P.M. (2012) *Lean Orientert Effektivisering av Rørproduksjon og installasjon hos Nymo AS*. Universitetet i Agder.
- Gadde, Håkansson, Persson. 2011. *Supply Network Strategies*, John Wiley and sons.47, 64-67, 82-104
- Gottschalk, P. 2006. ''Hva er et verdiverksted?'' . *Magma* 05/2006: <http://www.magma.no/hva-er-et-verdiverksted?tid=213203>.
- Hansen M.T.2009.''When internal collaboration is bad for your company.'' *Harvard Business Review*. April 2009.
- Håkansson and Persson.2009. paper number 62465 ''Organizing for interaction. The missing link in supply chain management'', 2-3.
- Huemer, L.2006.''Supply Management. Value Creation, Coordination and Positioning in Supply Relationships. ''*Long Range Planning* 39 (2006) 133-153.
- Huemer, L.2012. ''Unchained from the chain: Supply management from a logistics service provider perspective.'' *Journal of Business Research* 65 (2012) 258-264.
- Madison, D. 2005. *Process Mapping, Process Improvement and Process Management. A Practical Guide to Enhancing Work and Information Flow*. Chico, Paton Press.
- Merrow E.W. 2011. *Industrial Megaprojects. Concepts, Strategies, and Practices for Success*. John Wiley&Sons
- Minu Ipe.2003. ''Knowledge Sharing in Organizations: A Conceptual Framework.'' *Human Resource Development Review* 2003 2: 337
- Porter, M.E. 1985. *The Competitive Strategy: Techniques for Analyzing Industries and Competitors*; New York, Free Press.

Rummler, Brache.1995. *Improving Performance, How to Manage the white space on the organization Chart*, Jossey- Bass Inc

Simchi-Levi D., Wei Y. 2012. ‘‘Understanding the Performance of the Long Chain and Sparse Designs in Process Flexibility’’ *Operations Research*, Vol. 60, No. 5, September–October 2012, 1125–1141

Stabell, C.B., and Fjeldstad, Ø.D. 1998 "Configuring Value for Competitive Advantage: On Chains, Shops, and Networks", *Strategic Management Journal*, 19, 413-437.

Thompson, J.D. 1967. *Organizations in Action*. New York.: McGraw Hill.

Wang J.and Tang L. 2010. ‘‘Flexibility–efficiency tradeoff and performance implications among Chinese SOEs.’’ *Journal of Business Research*, Volume 63, Issue 4, April 2010, 356–362

Woiceshyn, J. and Falkenberg, L. 2008. "Value-creation in Knowledge Based Firms: Aligning Problems and Resources". *Academy of Management Perspectives*, 22, 2, 85-99.

Womack J.P. Jones D.T, and Roos D. (1995) *The Machine That Changed the World*. New York. Free Press

Fig.4 Ulstein Verft’s Sale Process

