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1 Abstract

Purpose

Well Innovation AS is an engineering company which both develops products on demand for a customer and develops products for their own portfolio. This has proved to be challenging in respect to obtain high efficiency in internal product development, while external product development has been more successful. The purpose of this thesis was to analyze the problem and suggest a solution on how to improve internal product development.

Approach

The suggested solution has been developed with a combination of a theoretical approach to product development processes and project management in product development, and case-relevant interviews of Well Innovation AS personnel.

Theoretical result

The theory suggests that different product development models should be considered for internal and external product development. Theory also suggests that organizations like Well Innovation AS have a great need for strategic project management.

Interview result

The interviewees all accept that the problem is real and requires recognition. There is a spread in arguments on what is the reason for the problem. This spread is beneficial for a good understanding of the problem. The arguments range from a technical point of view to an economic point of view.

Discussion

The results of the interviews are combined and discussed for conclusion purposes. The discussion then includes theoretical product development models, and tries to argue which of the previously introduced product development models to use in internal product development for Well Innovation AS.

Conclusion

Even though there is a spread of arguments in the interviews they all point towards the same thing; Well Innovation AS has a need for strategic project management development. This is supported by theory.

The thesis also suggests that Well Innovation AS is in need of a theoretical product development model to base their internal product development process on. A dynamic engineering model is suggested to be the most fitted.

Rapid organizational growth is suggested to have had a negative effect on internal product development. Clearer roles in the organization should be considered.

2 Introduction

2.1 Product Development: The oil market perspective

The market demand for product development services is in most cases not equivalent with the market demand for raw materials (Oil, gas, coal, etc.) in the energy business. This is due to economic principles. In an oil production company's perspective, if the oil prices are high and the company's revenue is excellent, you would obviously focus on production. If the oil prices are low the company will try to save money by cutting costs and maybe reduce production. On the other hand if oil prices are at a moderate level you would look for methods and products that could increase profitability. Changes in the oil price change the focus of the company producing oil and gas. Arguably the best market situation for a company that delivers product development services to the oil and gas industry is therefore when oil prices are at a moderate level. There are other factors as well, but the oil price can be used as an indication.

Some companies deliver product development services, some companies develop products for their own portfolio, and some companies do both. This thesis focus on companies that do both, and challenges they experience in doing so. A company that both develop products for others and products for their own portfolio needs to consider the market effect this might have. An issue of trust between the supplier and the demander could be developed since ideas and concepts can be misused. On the other hand if the product portfolio of the development supplier are in another market, and are not in direct or indirect competition, the situation would be appreciated.

2.2 Product development projects

Balancing between efficiency and innovation is one of the main challenges an organization has in the product development process. Innovation and developing new ideas are processes that arguably require a certain degree of freedom and creativity which is in contrast to obtaining an efficient process. Organizations that deliver product development as a service have to balance these two terms to obtain profitability.

The development of a product is project-based and follows the standard norms of project management. In many cases product development teams consist of different professions and people from different work environments and are therefore arguably difficult to manage.

2.3 Well Innovation AS

Well Innovation AS is a relatively new company that describes itself as an engineering, machining, testing and product company with main focus on down-hole technology for delivery to the global oil and gas industry. The company's own commercialized description is:

Commitment to Well Intervention, completion and drilling technology and to provide new innovative solutions based upon the company's unique competence and first class design skills.

Well Innovation AS started out as an engineering company that delivered product development services typically as concept and detail designs, but the strategy was to develop their own product portfolio financed by delivering product development services to other companies. For the oil service market it is important to have strategic suppliers in respect to ownership which makes Well Innovation AS an attractive supplier since it's self-owned.

The process of developing an oil tool product in Well Innovation AS is different from project to project, but mainly divided in to two different processes; external product development and internal product development. The difference between these is that in external product development projects there is an external customer, whereas in internal product development projects the company is its own customer/supporter.

The organization is dynamic and is using this to its advantage by delivering fast, innovative solutions to its customers. The organization consists of an unusually variety of personalities, cultures, ages and geographically birthplace of the personnel. This is a deliberate strategy from the company's top management as it fronts innovative solutions with different mind-sets to review the same problem. The work language in the company is both English and Norwegian, but non-Norwegian speaking personnel are encouraged to participate in Norwegian language courses.

2.4 Purpose of thesis

The background for this thesis was an unwanted trend in the product development phase in Well Innovation AS. A product development project where an external business was the customer had a higher degree of efficiency than an internal product development project, with no obvious reason.

The purpose of this thesis was to research this problem and suggest a solution to Well Innovation AS. It is a sub-purpose to set a base for other companies to best organize the product development phase for high internal product development efficiency in an organization that combine internal and external product development. The suggested solution will be based on a combination of case-relevant interviews and theoretical background.

2.5 Explanation of Key terms

Innovation: is used as a term that many associate with new ideas, new products, new technology and improvement of something existing. This thesis use the definition: *The successful exploitation of an idea that adds value to the customer and commercial return for the creator* (Cris Beswick's, 2010)

Product portfolio: is the collection of products the company produces and/or sells. In technology companies the product portfolio is normally changing often with adding and taking out products due to market demand, cost, technology change etc.

Incentive: is the reason for preferring one alternative instead of the others. It can be different for person to person, and it can result in the same or not the same perforation to a certain case. In this thesis incentive is used as a reason a person prioritize or is motivated to work on a project instead of another project. It is also important for the strength of motivation in a certain project.

Motivation: is the driving force that causes us to achieve our goals.

Efficiency: has been given an enormous amount of definitions. This thesis use the definition: *Efficiency is the degree of success related to the pre-set goal for a team* (Pfeffer's, 1999). In a product development project this can be interpreted as the degree of quality, cost and time that can be achieved in respect to the projects criteria.

Project: *A project in business and science is a collaborative enterprise, frequently involving research or design that is carefully planned to achieve a particular aim.* (Oxford English Dictionary)

Project management: is the discipline of planning, organizing, structuring and managing resources to obtain the projects overall goal. This thesis focuses on project management in respect to product development which arguably is not a traditional form of project management since there is the aspect of innovation to consider.

Model: *A model is an idealization of reality* (Andreasen and Hein, 1987)

2.6 Structure of thesis

- Main text
- Appendix

The main text is build up in a traditional form; an introduction chapter that covers background, purpose and a short explanation of key terms. Then a theoretical part where theoretical background, theory on product development, theory on project management in general and in product development processes are introduced and incorporated into the purpose of this thesis. This is followed by a series of case studies with interviews of personnel relevant to the purpose of the thesis. Next is the discussion chapter where the thesis arguments and non-factual answers are discussed. The last chapter is the conclusion of the thesis and a suggested solution to Well Innovation's problem.

The Appendix's consists of the complete interviews.

3 Focus and Framework

3.1 Focus of thesis

The focus of this thesis is on project management in product development projects. In that respect the thesis focus especially on the mechanisms that affects the efficiency of the project. Improving internal product development is the key area in the thesis being the initial issue. The thesis does not cover detailed project management areas, but merely the overall strategic management of projects and product development processes. The focus is at a corporate level.

In chapter 4, *Product development*, different processes within product development are introduced and in the next chapter, chapter 5, Project management in product development, project management are incorporated into the product development process.

The focuses of the interviews are different from person to person due to the different positions they have, and their ability to influence this thesis.

3.2 Theoretical framework

3.2.1 Product development theoretical background

The theory on product development is mainly gathered from: *Managing collaborative product development*, University of Mälardalen Press Dissertations by Sofi Elfving, (2007) with further reference to Ulrich and Eppinger (2003) and Ullman (2003). Elfving's dissertation *A Model for Identifying Key Factors in Product Development Projects* focus on the collaborative setting of product development which has many reflections that is relevant for this thesis. The collection of product development models are gathered from p.57-p.69 of the same paper.

Theory on key factors to successful product development is mainly gathered from Schimmoeller's research paper from 2010, *Success Factors of New Product Development Processes*.

3.2.2 Project Management theoretical background

The theory on project management is gathered from many different sources. The general project management theory is mostly gathered from University of Stavanger Professor Frank Asche's lectures notes in the course(s) Project Management (1 and 2) from 2010 and newly published litterateur (after year 2000).

Theory on strategic planning is gathered from Dr. Harold Kerzner's book *Strategic Planning for Project Management using a Maturity Model*. This book focuses on the overall planning of projects on a corporate level to reach the company's goals and ambitions.

Theory on human resources and motivation is gathered from Bård Kuvaas, *Lønnsomhet gjennom menneskelige ressurser* from 2008. (Translated: Obtaining profitability through human resources) This book focuses on planning, hiring, developing and general managing human resources.

3.3 Interview framework

The interviews were prepared in advance by gathering strategic questions to each interviewee. This interviewing method is called *structured interviewing*, which is used for getting different opinions on the same question. The advantage of this method is that the interviews are easy to reproduce since the questions are predefined and are therefore a normal interviewing method in research. Some of the questions were however only directed towards one of the interviewees as it was irrelevant for others.

There were three interviews, and all were taken place at Well Innovation AS headquarters at Forus, Røyneberg, Norway, in a neutral office which is used for guests and for other purposes. The interviews lasted for approximately 45-60 minutes each, and were recorded by a laptop with sound-recording software. The interviews were then written down and included as appendixes in this paper. In chapter 6, interview research, the essential parts of the interviews are being enhanced for discussion and conclusion purposes.

4 Product development

4.1 Project based product development

In former days, when products were simple and not especially complex, a single person would be able to develop/produce a product all by her/himself. As products grew more complex there was a need for a more organized form of product development, and now organizations that develop products organize these as different projects in their project portfolio. The products are in most cases multidisciplinary that require expertise knowledge in many fields. Projects like this acquire modern project management. [1], [2]

4.2 Different Product Development Models

As product development advanced in complexity in respect to the actual product there was a need for a more generalized way of engineering and therefore standardized models for product development were developed. There are many product development process models, and they arguably each have their range of use. [3]

The model of design and the development processes represent the structure of thinking and action in designing (Roozenburg and Eekels 1995). [4]

4.2.1 Product Lifecycle Model

One of the most common product development models in litterateur is the product lifecycle model. It is often referred to as a generic model [5], and consists of six phases (see *Figure 1*). Each phase produces the input for the next phase, and you have the opportunity of going back to the previous phases if new conditions are introduced.

This is a conceptual model so it needs to be customized to fit the specific project.

Product development requires interaction between nearly all functions of the firm, but especially from three departments; marketing, design/engineering and manufacturing according to Ulrich and Eppinger. The marketing department is responsible for exploring the products market opportunities, customer needs and other marketing activities. The engineering department is responsible for the physical realization of the product. The manufacturing department, also known as the supply chain, has the responsibility of purchases, distribution and installation. We see from the model that it is not a requirement that a customer is involved, and the model can be used in a situation where a company has been given a contract for development of a specific engineering object given the design criteria.

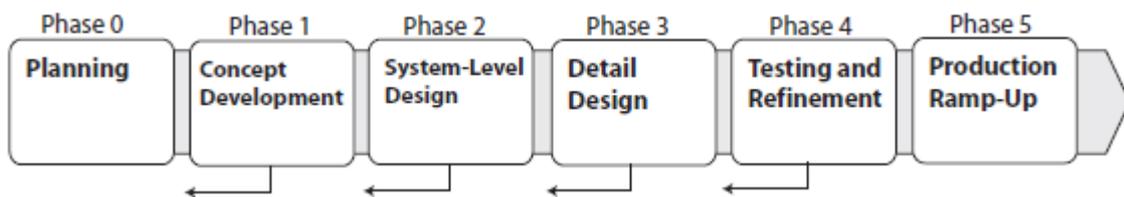


Figure 1– Generic model from Ulrich and Eppinger (2003)

A similar but more detailed model was introduced by Ullman (2003) [6]. This model has five phases (see Figure 2), where each phase have an approval decision before going to the next phase. This model does not reflect the situation described earlier, where a company delivers product development given the design criteria. But it gives a more detailed alternative in the situation where no customer is involved when the decision for starting the development was made.

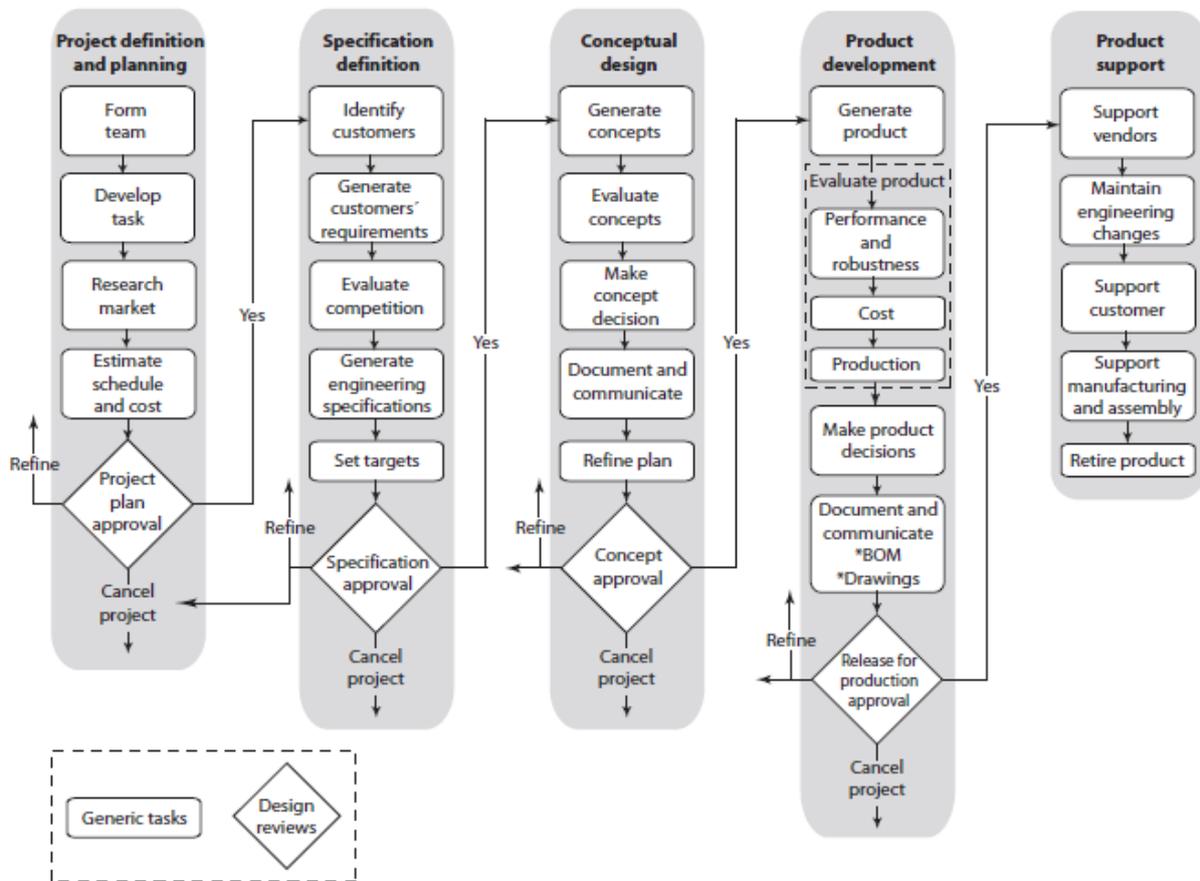


Figure 2 – Generic model from Ullman (2003)

4.2.2 Integrated Model

As described earlier the complexity of products has given a need for interdisciplinary collaboration between different fields of specialty. In an organization, where product development projects are part of the business, cross-functional teams with representatives from all the departments execute the activities in each project [7]. In that respect models have been carried out with focus on collaboration. Two of the models are *Concurrent engineering* and *Integrated product development*.

Concurrent engineering is a product development model that has evolved since it was introduced in 1986 by the Institute of Defense Analysis. The original definition was:

Concurrent engineering is a systematic approach to the integrated, concurrent design of products and their related processes, including manufacture and support. This approach is intended to cause the developers to consider from the outset all elements of the product life

cycle from conception through disposal, including quality, cost, schedule, and user requirements.

The modern form has some characteristics listed below [8]:

- Customer focus and involvement
- Early and continual involvement of suppliers in the design process
- Cross-functional, self-directed, empowered teams
- Incremental sharing and use of information
- Systematic and integrated approach
- Concurrent design teams
- Early use of Design for X tools
- Use of Modern tools such as CAE, CAD, CAM, FEM, etc.
- Continuous improvements of all processes

Integrated product development is the ideal model to be used in the process of product development [9]. The philosophy is that the interface between the different departments, marketing, design and production is focused upon and highlighted. Early involvement from every department is also important for best possible interaction and product development [7].

The model is illustrated in *Figure 3*, and starts with the recognition of a need (0). The next phases are (1) Investigation of need, (2) Product principle, (3) Product design, (4) Production preparation, (5) Execution.

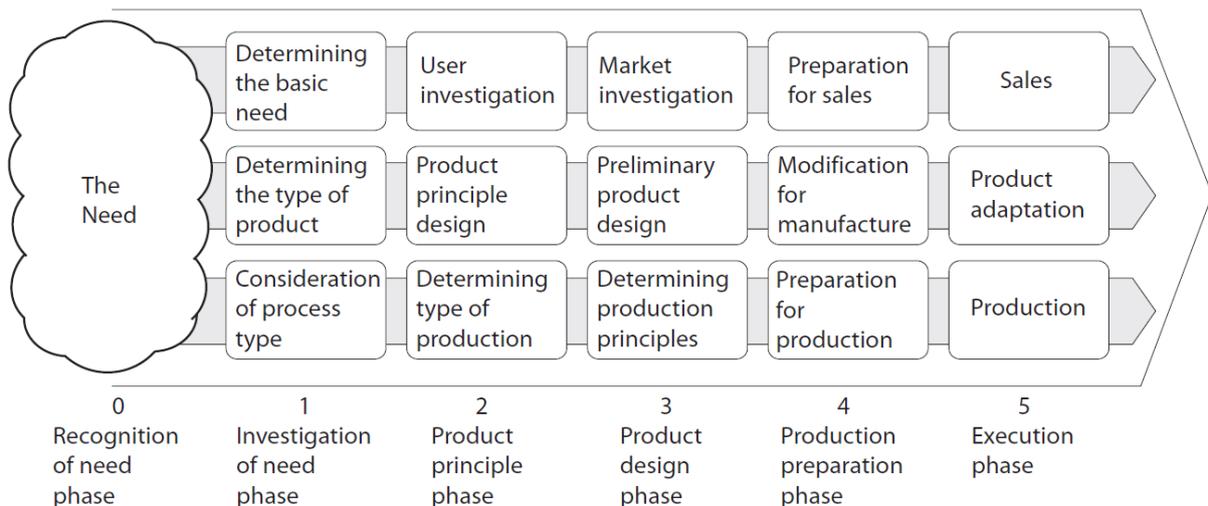


Figure 3 –Model of Integrated Product Development (Andreasen and Hein, 1987)

4.2.3 Dynamic product development

Dynamic product development is based upon that the process of developing a product will always be dynamic with no clear boundaries between the phases. This model is basically about developing qualitative products in a dynamic and resource efficient way. The main difference between internal product development and dynamic product development is the focus. In integrated product development the focus is on the customer, while in dynamic product development, the focus is on the actual user of the product.

Dynamic product development has a dynamic innovative organization with an integrative approach; see Figure 4 [10].

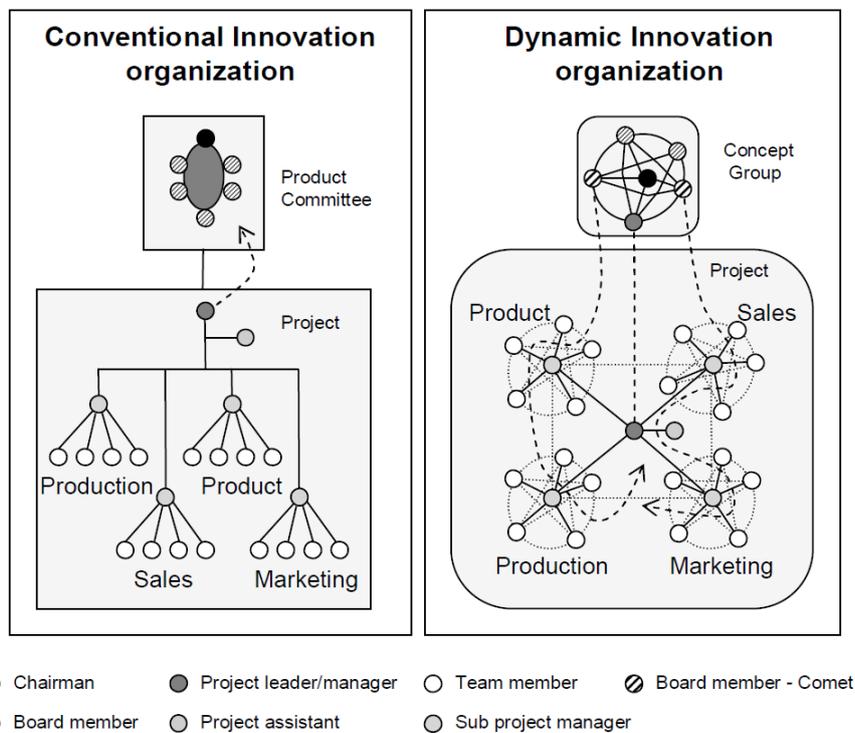


Figure 4 – Conventional innovation organizations vs. dynamic innovation organizations

4.3 Summary of product development processes

Listed in the table below are the different product development processes discussed in this chapter.

[3]

Authors	Type of Process	Phases	Focus
Ulrich and Eppinger (2003)	Product design/Generic	1 Planning 2 Concept Development 3 System-Level Design 4 Detail Design 5 Testing and Refinement 6 Production Ramp-Up	Marketing, design and manufacturing
Ullman (2003)	Generic	1 Project definition and planning 2 Specification definition 3 Conceptual design 4 Product development 5 Product support	General approach
Andreasen and Hein (1987)	Integrated Product Development	1 Investigation of need 2 Product principle 3 Product Design 4 Production preparation 5 Execution	The interfaces between product design, production and marketing.
Ottosson (1999)	Dynamic Product Development	1 Concept development and administration 2 Product development 3 Process development 4 Marketing and sales 5 Production	Creativity and end-user. Dynamic organisation.
Carlson-Skalak (2002)	Concurrent Engineering	1 Project planning 2 Product design development 3 Production process development 4 Production preparing 5 Production service	The interaction between product development and production. IT-tools.

4.4 Key Factors for Successful Product Development

Researchers have concluded that there are many factors that contribute to the degree of success for a product development project, but the most common organizational abilities found in firms with successful new product development processes [11] are:

- The use of cross-functional teams
- Management support
- A supportive organizational structure

The use of cross-functional teams has been recognized as the most important factor to success in new product development. Managing cross-functional teams will be more challenging due to the assembly of different professions and the potential minor conflicts due to resource allocation.

Senior management that is committed to the project has also been identified as an important ingredient to a successful product development process. Further research indicates that management support improves project team performance reducing the duration to make key decisions while the team receives key political, emotional, and financial support [11].

Multiple studies report that a proper organizational structure must be in place to support successful new product development. Additional research found support by top executives is important to a successful project, but the organizational structure may be more important because it has a continuous, daily influence on the team and mediates the environment factors in which the team operates [11].

Harold Kerzner [12] recognize organizational factors as key to successful project management, and compares it to a bar stool with three legs, one leg is the project manager, one is the line manager and one is the project sponsor. If one of the legs is lost or unusable the stool will be very difficult to balance. Kerzner recognize this balance as an important key factor to successful project management.

5 Project Management in Product Development

5.1 Project management

Project management has been with us for ages, but the modern form was first recognized in the 1950's where businesses and organizations was in need of a more organized form of the subject. This was a result of the growth of the economy and the sudden rise in the complexity and ambitions of the projects.

Project management contains four main activities:

- Planning
- Organizing
- Controlling
- Managing and motivating

These activities are used to reach the projects specific goals and objectives. A project is normally brought to life to bring benefits and/or add value to the organization. In most cases a professional management of the project is needed to do so, and the degree of success of the project can directly be related to the management skills of the project management. A project manager needs to have two different types of skills, hard skills and soft skills [13]. Hard skills are those related to technical competence such as planning, estimating and control. Soft skills are those involving communication, leadership and motivation. There is no real answer to the question of how a perfect project manager should be because every project is unique and acquire different project management skills. Some projects are even organized to change project manager at one or more times.

5.1.1 Planning

In the planning phase it is important that a project scope is defined. The degree of details in the planning phase depends on the situation and type of project. The goal of the planning phase is to get an overview of what needs to be done and why, decide who will do what, decide how it should be done, and get an overview of the costs in the project. [13]

5.1.2 Organizing

In the organizing phase you would set up a project structure where the structure must support the overall goal of the project. A projects structure is crucial for getting the correct incentives of the workers and other interests in order to meet the overall goal. The correct structure ensures that all involved prioritize the project, knows what is going on, communicate efficiently and strive for the same goal. [13]

5.1.3 Controlling

In any project you would need a type of measurement to check if the project is going on as planned. These measurements are needed to have control over the project. At a controlling point in time you check the status of three important attributes, *time*, *cost* and *quality*. These attributes are controlled against the pre-set values of estimated time, budgeted cost and agreed upon quality. [13]

5.2 Managing product development

Managing product development does in most cases mean managing different professions and environments. It is therefore considered a challenge to have the responsibility of making these groups or individuals communicate and co-operate in the best possible way [3]. Conflicts of interest and hard discussions between the different groups/personnel are not unusual, and in some cases unavoidable. The company might still get stronger from these discussions since participants get a steep learning curve from the situation. But during these discussions it is important that the project manager have control over the group and try to solve the disagreement in the best possible way for the overall goal of the project and the company.

Other than the having to manage different professions in an innovation environment the project management in product development can be considered traditional.

5.3 Motivation

Motivation is normally split into two; internal motivation and external motivation, where internal motivation comes from within the person and external motivation can be considered as environmental effects on the person, like for instance a boss giving you a task and a deadline. Studies are very clear on that in general internal motivation gives the best work results [14]. But the actual scope of the work will be a factor for deciding which of the two types of motivation gives the best results. For tasks that require quality, understanding, learning, development and creativity, internal motivation is the most effective, whereas a task that is simple and standardized external motivation is the most effective.

Motivation in a product development project can be considered at many levels; motivation of the management, motivation of the project management, and motivation of the project team. Since in most cases there is a correlation between these different levels it is important to consider motivation from the top and down. [14]

5.4 Efficiency in new organizations

In new organizational design embracing teams is akin to the biological world, where uncontrolled environments and actions produce remarkable results of efficiency and effectiveness through a process of self-management and adaption. In such environments the teams are encouraged to design and execute their own strategies, to experiment, and to seek information and assistance wherever necessary to include organizational members, suppliers, customers, and other stakeholders. [15]

5.5 Enterprise Project Management

Enterprise Project Management (EPM) is the conscious integration of processes, technology, organization structure and people in order to align strategy with the execution of projects [16]. EPM is not all that different from basic project management, but it varies sharply, however, in the way it is applied and the emphasis that is given to each area of expertise. Whereas basic project management is aimed largely at answering “How can we get this project done effectively and efficiently?” enterprise project management poses the question “How can we make this business more adaptive, responsive and thus more profitable in a rapid changing, multi-project environment?” The two concepts are highly complementary, and work together to boost company’s productivity and effectiveness [17]

5.6 Strategic planning

Strategic planning for success in project management needs to consider all aspects of the company; from the working relationship between employees and between staff and management, to the roles of the players, to the company’s corporate structure and culture. Other aspects of project management must also be planned. Strategic planning is vital for every company’s health. Effective strategic planning can mean the difference between long term success and failure. Even career planning for individual project managers ultimately plays a part in the company’s ability of success in project management. [12]

6 Interview research

6.1 PM/DE, Well Innovation

Chapter refers to Appendix A

Paal Henrik Sandbu has been a design engineer and a project manager in Well Innovation since 2007 where he has been a key member of the Well Innovation engineering department.

Sandbu has experienced many situations relevant for the purpose of this thesis, and this experience makes him an excellent source of information with respect to the problem. His knowledge could potentially directly point to the root of the problem given his unique position in the process of product development.



Sandbu is very eager and direct in his interview, and goes straight for the issue. On the question about his thoughts on the problem with internal product development projects in Well Innovation he replies:

“...it all comes down to motivation, and that again comes from a project manager that clearly defines targets, is structured and manages to setup a project plan. And I also think it’s important that he/she is professional in respect to his position. She/he should not be a friend, but instead a supervisor for the design team.”

He addresses the importance of having a project manager that is professional in respect to his/her role, and hints that there is a lack of supervisor skills in the company.

On the question about if he thinks the organization has the correct incentives and motivation factors in place to obtain an efficient organization, he replies:

“I would say that there are times where motivation is too low. And I think this is a result of missing initiative to develop or hire good project managers. In the beginning the project manager and the design engineer was often the same person, and this is a something that still hangs in there for some people.”

Sandbu seem to focus on the project management in the business when asked about motivation. He also addresses the classical growth problem where an employee would have many different

responsibilities in a small company, and as the business grows you would need to split up the roles, and have clearer responsibility areas.

When asked about the role of a project manager in product development he replies:

"...He/she should definitely be involved in the design of the product, but if the project manager needs to do the actual design works, then I think that's not really a good setting because you're kind of on both sides of the ball with setting the timeline and making it..."

Again he focuses on the clarity of the project manager's role. But he hints that the project manager should have experience in the actual design process at a lower level.

When asked about his earlier statement, regarding developing project managers he agrees that a design engineer with the correct personal abilities can become an excellent project manager and relies:

"Then you know where things are difficult, and you would have a wider knowledge of problems that occur in the process. And also when it comes to communication you have an advantage because you would know the communication process in the design team..."

The interview was then turned towards internal vs. external product development, and the presence of an external customer. When asked if an external project put more pressure on you than internal he replies:

"Yes, there is a big difference. Especially with a customer that often follows up on the project. For instance meetings every other week, or even every week in the start phase of a project. Then you have a pressure to deliver every time. You know that these people pay for it, and they expect a return of their investment. Simultaneously you also have a desire to show new people your skills and professionalism since you are representing both the business and yourself. On the other hand you have internal projects where maybe the targets are a bit vague, and then you feel a kind of freedom as a project manager..."

Sandbu addresses the different incentives you would have to deliver on external projects, and also mentions the missing incentives to deliver on internal projects. External projects seem to create their efficiency by the fact that they have an external customer that expect quality deliverance, while internal projects need motivational initiative from the management, according to Sandbu.

When asked about the one reason for the problem this thesis focuses on he replies:

"I would definitely say that the reason for the problem is that you don't feel the pressure of delivering for somebody you know well and that are easy to talk to because they don't really criticize you"

When asked about his opinion on the importance of a good organizational structure in a product development business he replies:

"...to have a good organizational structure on paper do not mean that you actually have a good structure in real life. What is really important is that the management follows up on the structure by following up on people. Well Innovation has grown a lot, and in the beginning some people had a foot in almost every aspect of the business, Chief Engineer for instance, at some point he needs to give up some areas of responsibility. He can't be involved in design, sales, HR, administration, project management, and other things anymore. The structure of the organization should be clearer with respect to the professional roles of the company."

Again he addresses that the roles in the company should be clearer from his point of view.

When asked about if he feels that the best engineers get to work on the external projects, he replies:

"Yes, I think that there is some truth to that. You would wish to give the best possible impression. And in the situation where you have available engineers I feel that the best and these how deliver quality are prioritized."

"...it can absolutely be a reason for the problem."

He agrees that when an external customer is involved the people responsible for putting together teams use the most efficient and experienced engineers to impress the customer. He also acknowledges this as a potential reason for the problem.

When asked if engineers would prioritize projects when working on multiple projects he replies:

"Yes, that is a very true assumption. Personally I would definitely prefer to work on just one thing. Gives you more focus and the quality of the work would definitely be better."

"... Here you would prioritize the project with the project manager that pushes you the most."

From his point of view, Well Innovation gives the engineers the freedom to prioritize the projects they are working on to a certain degree.

When asked if it is the actual behavior of the customer that puts pressure on the project or just that aspect of having a customer he replies:

“...I would say that the behavior of the customer definitely has an effect on the process of the project, but how big this effect is I don't really know.”

“The customer does not affect the design engineer directly, but through the project manager”

So he admits that the customer's behavior have an effect, but does not want to put the responsibility of the problem here.

6.2 PM, Well Innovation

Chapter refers to Appendix B

Øystein Skjæveland currently works as project manager in Well Innovation and he has broad experience from product development, primarily from the oil and gas industry. He has worked with projects his entire professional career, many of



which he has managed. Skjæveland's role as project manager in the product development process in Well Innovation makes him a key person in addressing the different phases that might support the purpose of this thesis.

After an introduction he was addressed the question about the difference between engineers in general. His response was:

“Like humans in general the difference is enormous. Here in Well Innovation we have some that are very calm, that you have to give a lot of feedback to. If you are strict with them they get nervous. Others can boycott the work if you are too strict. And then you have those that enjoy a good discussion. They have a strong opinion and a strong personality, where you almost have to fight through a discussion that can result in the most fantastic solutions. Then you have those who are idea-machines, very positive all the time and with a good drive. Some are academics and likes to use a lot of time of thinking at issues and solutions. So I would say we have a wide specter of personalities in the engineering department.”

He obviously address that there is a difference between people in general, and a different approach in respect to motivation to different people are necessary.

When asked if the company has the right mechanisms to motivate the engineers, considering their different personalities he replies:

“For me the project manager, but also the engineering manager, have the responsibility of motivating the engineers in the different projects. I like to think that I do things differently than other project managers. For instance, I recently invited the project personnel out on some pizza and beer. I also arranged a party with barbeque, waterskies and other fun activities. This is the way I like to motivate the personnel and build a team.”

From his point of view the task of motivating the engineers during the product development process is all on the project manager and the CEM. His way to motivate and build a team is organizing social events.

When asked about the difference between internal and external projects, Skjæveland replies:

“From an engineer’s point of view I would say the external project is more important, and internal project lacks the drive to succeed. “I will not make it today, so I might finish tomorrow or the day after that” would be a typical thought. The drive and desire is not there.”

Skjæveland is quick to address the issue of lacking motivation and efficiency on internal projects and when asked if there is no pressure on the engineer he replies:

“...I would say that the pressure is there, but that the engineer does not feel it. And when the project manager comes to the engineer with a request the engineer sees this as more of a hustle than actual productive work...”

This response suggests that there is a general attitude in the company that internal projects are not that important.

When asked if an external customer puts more pressure of the project manager because of in the situation where you deliver a presentation of the work you are standing in front of a group of unknown educated people and you represent the company to the fullest, whereas internal projects you would present your work to “a familiar face”, he replies:

“Yes, I would agree to that. But I would also say that the actual importance of the product for the overall business plays a big part in the game as well. If you know that this product, even though internal, directly can affect the life of the company then the pressure would of course be high. And the pressure would be on the project manager. It is his responsibility to communicate the importance of the project to the project personnel.”

Skjæveland insists that there is another approach to the problem, and address that the importance of the project with respect to the overall goal of the company is a key aspect that needs to be considered. If a project is very important to the company, the pressure and motivation is there regardless of if the project is internal or external, from his point of view.

When asked to put his finger on the one thing that needs to change in order to fix the problem, he replies:

"I would say the motivation of the engineers, but also communication of the importance of every single project."

His response suggests that the engineers don't have the motivation due to the lack of communication of the importance of the projects.

When asked if the project manager is responsible for this communication, he replies:

"...I would split the responsibility to both the project manager and the CEM. But also the management in general has a responsibility of motivating the personnel."

Skjæveland was then asked if when choosing engineers to work on external projects you would choose the best, and leave the others for internal projects. His response was:

"Yes and no. We have one internal project now where, from my point of view, one of the best engineers, are working. But yes, for some internal projects we use those engineers that do not always deliver quality."

He admits that when choosing engineers you would preferably put the best engineers on external projects, but not necessarily. As suggested earlier from Skjæveland, you would put the best engineers on the important projects with respect to the company's overall goal, regardless if it is internal or external.

Skjæveland was then asked if the role of project manager should be separated from the design engineer. He responded:

"No, I think that a design engineer can be a good project manager. And I think it is a must for a project manager to be able to use the design tools and have experience from the product development on the design level and also production, especially when customers are involved. And I think that one of the strengths of this company that some of the project managers also work as design engineers. And really there are few administrative tasks for the project manager on minor product development projects. But to work as a project manager on multiple projects your situation would be different."

"Of course not every design engineer can be a project manager..."

Skjæveland supports the organizational structure in the company with respect to the product development process and thinks that the role of project manager and design engineer could easily be combined. As a follow-up question Skjæveland was asked if it, from a design engineers point of view,

would be easier to deliver work to a project manager that was for instance on a different floor, he replied:

"...I think that the pressure to deliver would be higher, even though it should not be like that. But the roles should always be clear."

He admits that the clarity of the project manager role would have a positive effect on motivation.

Lastly he was asked if the customer's activeness would affect the projects efficiency. His response was:

"Yes, if the customer is not active, the project manager might not be as active, which again makes the engineers not so efficient."

6.3 CEO, Well Innovation

Referring to Appendix C

CEO and Master in Business and Economics, Stein Danielsen, was the person addressing the original difference between internal and external projects in Well Innovation. His professional background comes from the business aspects of the oil and gas



industry. When Danielsen started as CEO of Well Innovation, the company had about 12-13 employees. Now it has about 60 employees, so Danielsen has been responsible of re-structuring the company for growth and has had many challenges in respect to organizational structure, creating a platform for industrial growth, innovation and creating efficient product development processes.

Danielsen's history with Well Innovation and his leading role in building up the company makes him a key person with respect to the purpose of this thesis. The interview of Danielsen is directed towards organizational structure.

Danielsen was asked which type of projects the company had in the beginning. His response was:

"Often the projects were related to concept development. Where you have a customer that wants to check something out, find an answer to something. And you would get a contract of a small amount of money to make a concept to see if something was possible. Some projects were taken to the next level where you got into more detailed engineering..."

He continued:

"...Most of the projects where we developed a concept for a customer were based on hourly payment, and that gave us really not a big need to control the projects because that was the customer's responsibility. In project with fixed price you have a need for project management, but we didn't really have much of that in the beginning. It was only after a while we had the need for project management though. Lastly you had the third alternative which was internal product development, where often engineers were in control, and they were very motivated and proud of the product. The sad thing is that was projects that really took way too long to finish."

Danielsen address that in the beginning the company did not have a need for a project management because the engineers worked as consultants for other companies. He then talks about internal product development, and that those projects did not have a professional project management, but

they had motivated and proud engineers as project managers. He hints that there was a lack of thinking in the best interest of the business economical goal.

Danielsen was then asked if it was the founder's idea from the beginning to be an engineering company, and then at a certain point in time decided to restructure the company to a product company. His response was:

"...to develop a product portfolio was actually the founder's idea from the beginning. But to cover that cost we did development projects for others..."

He continued:

"...once the cash flow was there we started development of our own products. Also one thing we did was to contact the big oil and oil service companies and ask for financial backing in the terms of substituted prices but Well Innovation would be the owner of the product. We didn't want to be a consulting business, but a production company with our own products."

His response suggests that there was no strategy change that would potentially cause an upset in the company.

When asked where he first discovered that internal projects were not doing so well, he replied:

"...it seemed to me that the engineers when working on internal projects had the attitude "There was still a problem, so I need to just continue working on it". And the cost was building, re-machining, more testing, back and so forth all the time, not going anywhere. And it was obvious to me that we needed a much better process in the planning phase of the projects. We then initiated strategy meetings with lead engineers, and other relevant personnel to make some key decisions on what the customer wants, what is interesting to work on, Is it technical possible to finish, how many hours was needed and so on. This was also done to give the engineer the understanding that if he/she doesn't deliver on what he/she promises then we would cancel the project on a much earlier stage then before."

He addresses the initial problem and suggests that the reason is bad planning. His response also suggests that there was an amateurish attitude by the project managers/engineers. He suggests that they took action and initiated various measures to get rid of the problem.

When asked about the root of the problem, his response was:

"For me it is about responsibility and understanding. If the engineers responsible do not adequately know what he/she is responsible for then you have a bad situation. A problem we have is that our

engineers want everything perfect. Every single detail of a product needs to be perfect for our engineers. But they don't really think about the cost vs. gain concept that you have to keep in mind. Don't choose the most difficult solution first, but prove that it works first in an easy way for instance. Very often you would have a too detailed first concept and too much work on something that might not work at all. For me, that is like making a space shuttle when all you need to succeed is a small plane."

Danielsen clearly address the importance of profitability in a project, and also the need to think in the best economic perspective of the company. He suggests that the engineers want everything perfect, and that they are not able to make a simple concept when a simple concept is what is needed. He says that this problem is due to lack of responsibility and understanding; a lack of responsibility for the project's profitability, and a lack of economic understanding in respect to project economics.

Well Innovation is a company that has grown a lot since the start in 2005 and Danielsen was addressed with a question regarding the structure of the company. His response was:

"...there is absolutely no doubt that a growing organization like Well Innovation will experience organizational challenges. And at a certain point in time you need to go into new organizational phases. Now, with the order reserve we have today, we are looking to strengthen our squad, especially in project management. But it is important that we don't hire too early, with respect to maximum profitability."

Danielsen admits that the company is not as strong in project management as he wants it to be, but he again addresses the importance of profitability. He wants to hire personnel at the correct time to minimize the cost.

Well Innovation established a product company that they called "Well Innovation Products" in 2010. The CEO was asked if the problem with internal projects can be fixed by giving the company "Well Innovation Products" the customer responsibility. His response was:

"It really depends on how you organize "Well Innovation Products". If "Well Innovation Products" always owns the products, then yes, they will act as the customer. But if "Well Innovation Products" is split even more, for instance in Completion, Intervention, N & A, then they will not act as the customer before the product is finished and ready for commercialization. We have done this many times now and our experience tells us that the earlier you would establish a company with its own customers the better it works out."

Danielsen admits that the newly established company, “Well Innovation Products”, can potentially solve the initial problem by being organized as the customer for internal product development projects. But even if this is the case he seems to see a different use of “Well innovation Products” that would be a bigger contributor to the overall goal of the main company.

When asked about competitive tendering of the engineering department he is clear on that it is not an option to be considered. It has been done before with no go result:

“...the most important principle is that everything must be kept within reach. If you have a part of the organization that suddenly have a different label than the rest, and they say that they are not happy with the engineers, so they want to hire their own engineers, then that is a no. We don’t want to make a new engineer group. The backbone of Well Innovation will be Engineering, Machining and Testing, and the goal is to produce spin-offs from this backbone that is the underlying business strategy. That is one reason. Another reason is that it would not be healthy for an organization of this size to create that kind of environment. Also it is important that the prices between the departments are on a market level, otherwise this would not have worked.”

The CEO was then asked if he agreed that the solution to the problem should focus on solving the lack of seriousness in the project management phase of internal product development. His response was:

“Yes, and I suggest that when you are going to present your work there should be an almost “stupid” process with a checklist that the presenter fills out; Have I done this? Have I done that?”

6.4 Key comments

“I would say that there are times where motivation is too low. And I think this is a result of missing initiative to develop or hire good project managers. In the beginning the project manager and the design engineer was often the same person, and this is a something that still hangs in there for some people.”

“I would definitely say that the reason for the problem is that you don’t feel the pressure of delivering for somebody you know well and that are easy to talk to because they don’t really criticize you”

- Paal Henrik Sanbu, Design engineer

“For me it is about responsibility and understanding. If the engineers (project managers) responsible do not adequately know what he/she is responsible for then you have a bad situation. A problem we have is that our engineer’s want everything perfect ... they don’t really think about the cost vs. gain concept that you have to keep in mind. Don’t choose the most difficult solution first, but prove that it works first in an easy way for instance. Very often you would have a too detailed first concept and too much work on something that might not work at all. For me, that is like making a space shuttle when all you need to succeed is a small plane.”

- Stein Danielsen, CEO

“From an engineer’s point of view I would say the external project is more important, and internal project lacks the drive to succeed. “I will not make it today, so I might finish tomorrow or the day after that” would be a typical thought. The drive and desire is not there.”

Skjæveland is quick to address the issue of lacking motivation and efficiency on internal projects and when asked if there is no pressure on the engineer he replies:

“...I would say that the pressure is there, but that the engineer does not feel it. And when the project manager comes to the engineer with a request the engineer sees this as more of a hustle than actual productive work...”

- Øystein Skjæveland, Project Manager

7 Discussion

7.1 Interview research

7.1.1 Interviewees

The project manager and design engineer Pål Henrik Sandbu's view on the subject is arguably a technical point of view, with focus on having good and standardized procedures and work instructions. In respect to improving the product development processes in the company his views reflect long term thinking and not necessarily profit at every turn if the gain is bigger in the long run.

Well Innovation's CEO Stein Danielsen's view on the subject is arguably an economic point of view with focus on the company being profitable and efficient. In respect to improving the product development processes in the company his views reflect quick and non-complicated thinking, and he is confident that the discussed issue will have a simple solution.

The project manager Øystein Skjæveland's view on the subject is arguably a mix of both economic and technical thinking. He also focuses on the importance on man-management and in general the handling of human resources.

7.1.2 Answers combined

Combined the interviews support that the problem is real and require recognition. It is uniformly accepted that the problem has its origin in project management, but not necessarily with the project manager, it is rather suggested that the problem lies in organizing project management and the lack of resources put into developing this part of the organization.

The combination of answers arguably gives a good understanding of the problem since the personalities reflect different interest and different point of views. The combined arguments range from technical arguments to economic arguments.

7.2 Using the optimal development process

Every organization is unique because it is build up by unique individuals. An optimal product development process will therefore not be the same for everyone. This thesis present some well-used product development processes, see chapter 4.3 for summary.

Well Innovation use a product development process based on experience, with no clear standard process based on theory. Every project manager has its own methods and there is thus a mix of different approaches which is no good. The company is in a phase where it needs to get more standardized and to choose a clear product development process should obviously be considered, but the optimal product development process might be difficult to find. Should the development process be the same for internal and external product development? Maybe it would be best to divide up these two processes, and standardize a product development process for both of them.

7.2.1 External product development

Well Innovation AS has been successful in external product development projects. It is suggested that the reason for this is a combination of a pro-active customer, pressure on the project manager/engineer, skillful personnel on the project team and general focus on the project. It can be argued that Well Innovation AS uses a modern form of concurrent engineering in their external product development projects. This process works well for the company so it would be obvious to still use this approach. It would however be a very good idea to document the successful process so that it can be repeated and/or analyzed for beneficial reasons.

7.2.2 Internal product development

Well Innovation AS has not been very successfully in internal product development projects. It is suggested that the reason for this is a combination of: no pro-active customer, lack of demand from the project sponsor, less skillful personnel on the project team and in general an attitude in the company towards that these projects are not important to finish. The consequences of this are high cost.

The interviewees suggest that these projects are bad planned, and really just live their own life with no defined development process. Obviously these projects needs a standardize development process preferably based on a theoretical product development model. The model that fits these projects best is arguably the dynamic product development model. The main difference between concurrent engineering model and dynamic product development is the focus. In the concurrent engineering model the focus is on the customer, while in dynamic product development, the focus is on the actual user of the product. To understand how this model work in detail and implement it into the company can prove to be very beneficial for solving the efficiency problem.

7.3 The role of the customer

The interview research suggests that the activeness of the customer has an effect on the motivation of the project. This can be supported by theory on motivation. An active customer would give feedback, both positive and negative, and in general seem interested in the concept or presentation. This will be in contrast to a passive customer whom will affect the projects motivation in a negative way.

It is clear that there is a customer effect. But is this the reason for the difference between internal and external projects in motivation and efficiency? Sandbu suggest that it is one of the reasons while Skjæveland suggest that it is the importance of the project that is the real reason.

7.4 Innovation vs. efficiency

The balance between innovation and efficiency is a subject with many strong opinions. There is no factual answer on how the proportion should be, but the specific situation can be decisive in what should be the focus. In order to balance between innovation and efficiency you will have to consider the need for innovation. If the need is conventional, should innovation be the focus? To quote Danielsen: *don't make a space shuttle when all you need is a small air plane.*

On the other hand you can say that the word *need* is vague, and many of the great new technologies would not have seen the light of day if it wasn't for engineers that stepped into the unknown and used innovation to the fullest.

7.5 Individualism

Motivation in product development is considered in this thesis and is defined as the driving force that causes us to achieve our goals, which means that motivation is individual. Managing and motivating human beings can be and has been standardized for optimum results, but since the concept of individualism is to be considered there is limits on how much you can standardize. Motivating other humans is therefore a skill which can be more or less thought to people in management positions, and it involves dealing with individualism.

Being a manager with responsibility of motivation other human beings, for instance a project manager in Well Innovation, you should be able to deal with individualism. This involves adapting your management technics to the different individuals.

7.6 Sources of error

7.6.1 Manual hours

Engineers and other workers in Well Innovation are normally working on multiple projects. They are also responsible for manually putting in their hours every month and specify which project they worked on. This gives room for economic error in respect to cost.

This source of error is thought to have some effect, but not enough to be the cause of the problem.

7.6.2 Choosing teams

When management in Well Innovation chooses a design team they will prioritize personnel. This is a big source of error, and can potentially be a direct reason for the problem. This is supported by Sandbu. Management would put their best people on external projects, and others of whom are not involved in anything at a specific point in time, work on internal projects. This strategy should be reconsidered as it undermines career development.

8 Conclusion

8.1 Project management development

This thesis suggests that a company that has both external and internal product development projects have a great need for strategic planning in the organization. Design engineer and project manager in Well Innovation AS, Pål Henrik Sandbu, recognize a need for a more professional project management in the company, and asks to put more resources into the career development of project managers. This is supported by Dr. Harold Kerzner who advice individual career planning for project managers, and suggests that this is a factor of success for a project-based company. Internal motivation is recognized as what gives best work results in a product development business. Therefore strategic thinking which should involve professional development of project managers should be prioritized. Give the project managers internal motivation, and teach them to give the design team internal motivation.

CEO of Well Innovation AS, Stein Danielsen, suggests that there is a greater need for planning and business understanding in internal product development processes in the company. He talks about the need to think with an economic mindset. This supports the above statement that there is a need for a more professional project management that can understand both the technical and the economic aspect of the project.

The initial problem was that internal product development was not profitable due to the use of too many hours, too much testing and too much use of resources. This thesis suggests that this is due to bad strategic planning, which reflects the lack of seriousness and motivation of the project managers, which again comes down to strategic enterprise project management at a corporate level.

It is speculated that a customer has a positive effect in a product development project, which the research suggest has some truth, but really it is more of an excuse to the overall problem. It is an excuse because there is always a customer/sponsor; the project manager always has someone to deliver the results to and this is a key area of improving the internal product development projects.

Project manager in Well Innovation AS, Øystein Skjæveland, suggests that the importance of a project in respect to the overall goal of the company is an important aspect of the situation, not if there is a customer or not, which also points to the process of strategic planning of enterprise project management. Skjæveland's comments suggest that higher communicated importance of a project gives the project manager internal motivation.

An advised solution will be to develop the project managers in a professional way, since very few project managers in the company has a theoretical background from project management this could be very much appreciated for all parts, and be an enormous factor of internal motivation for the project managers.

8.2 Standardize a development process

It is clear that internal product development in Well Innovation AS needs to follow a standardized development process to be successful. It is recommended to follow the dynamic engineering model for these kinds of projects. Internal product development will have to have an innovative and dynamic approach, but it still needs to follow a standardized process, so there will be a need for balancing here. This can be obtained by professional project management.

8.3 Rapid growth problem

Well Innovation AS was not long ago a small company with few employees. Sandbu and Danielsen agree that there are still some minor negative organizational effects due to rapid organizational growth. This is difficult to handle and is part of the problem. People who have been employed during this transition period might not recognize the different roles as clear as they really are. Sandbu talks about that in the beginning there were so few employees that they developed a very friend-based environment, and he suggests that this still has some effect in the company when presenting work to the engineering manager, whom will act as the customer/supporter in internal product development projects. This aspect should be considered at a corporate level.

8.4 Project teams

Strategic options should be considered when choosing project teams. This is an important aspect of the situation and needs to be recognized at a corporate level. Project teams should be assembled to meet the project goal, but the company's long term goal should also be considered.

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10 Appendix A

Interview with Design Engineer and Project Manager, Paal Henrik Sandbu, 22-03-2011 at 12:00.

Can you tell me a little bit about yourself, your background, education, and so forth?

Yes, my name is Paal Henrik Sandbu and I am a design engineer and project manager in Well Innovation. I have a master in Material Technology from NTNU in Trondheim.

How long have you been working in Well Innovation?

Officially started in the summer 2007, but also had a summer job in 2006. Came straight from the University, but I did some other stuff before I started studying at NTNU, and I must admit that if I had come straight from high-school to NTNU to Well Innovation, I wouldn't have been able to adapt to my role so quickly. I took with me a lot of leadership experience from the military service.

You know the background for this thesis, and the reason that I want to talk to you is your experience and position in both project management and product development. I know you have been design engineer in both internal and external projects, but have you been project manager in both as well?

Well. I have had some external projects, one with Well Bore solutions where we developed a tractor and one with BP for a Barrier Valve which unfortunately was cancelled. I have not really been that much involved in internal projects in one way, there was this Liner Hanger project which was external, but felt very much internal because of a customer that was very passive. Nevertheless I have made up some thoughts about internal projects...

Yes, let's hear you thoughts around internal projects.

Well, it all comes down to motivation, and that again comes from a project manager that clearly defines targets, is structured and manages to setup a project plan. And I also think it's important that he/she is professional in respect to his position. She/he should not be a friend, but instead a supervisor for the design team.

Considering Well Innovation today, would you say that there are sufficient with incentives and motivation factors in the organization to make people work hard?

I would say that there are times where motivation is too low. And I think this is a result of missing initiative to develop or hire good project managers. In the beginning the project manager and the design engineer was often the same person, and this is a something that still hangs in there for some people.

So you think that a project manager should not do any design work?

Well, he/she should definitely be involved in the design of the product, but if the project manager needs to does the actual design work, then I think that's not really a good setting because you're kind of on both sides of the ball with setting the timeline and making it. Maybe you treat you self to nice?

You talk about the importance of developing project managers; do you think that a design engineer with the correct personal abilities could be the right candidate to develop into a project manager?

Absolutely, absolutely. Then you know where things are difficult, and you would have a wider knowledge of problems that occur in the process. And also when it comes to communication you have an advantage because you would know the communication process in the design team, whereas maybe a new project manager with no/little product development experience would only communicate good with his/her boss.

Do you think that a project where you develop something for a customer puts more pressure on you then a project where you develop something for the company's own product portfolio?

Yes, there is a big difference. Especially with a customer that often follows up on the project. For instance meetings every other week, or even every week in the start phase of a project. Then you have a pressure to deliver every time. You know that these people pay for it, and they expect a return of their investment. Simultaneity you also have a desire to show new people your skills and professionalism since you are representing both the business and yourself. On the other hand you have internal projects where maybe the targets are a bit vague, and then you feel a kind of freedom as a project manager. This problem can be solved by giving clear targets and deadlines to project managers. That can be done by having an internal commissioning to a person not in the design engineer team.

If you could now think about the initial problem with the difference between internal and external projects, if you were to put your finger on the one thing that is the reason for the problem, what would it be?

I would definitely say that the reason for the problem is that you don't feel the pressure of delivering for somebody you know well and are easy to talk to because they don't really criticize you. And if I could mention another thing I would say that lack of clear roles within the manager group.

Do you think that a clearer organizational structure could somewhat solve the last mentioned problem?

Well. To have a good structure of the organizational on paper does not mean that you actually have a good structure in real life. What is really important is that the management follows up on the structure by following up on people. Well Innovation has grown a lot, and in the beginning some people had a foot in almost every aspect of the business, Chief Engineer for instance, at some point he needs to give up some areas of responsibility. He can't be involved in design, sales, HR, administration, project management, and other things anymore. The structure of the organization should be clearer with respect to the professional roles of the company.

Where do you think the bottleneck of the product development process is?

I feel that at the present time, the bottleneck of the company is the phase where you go from prototype to production. This is the place in the design process where Well Innovation has the biggest challenge. That is my opinion.

What about the checking and approving phase of the design?

Well, I would lie if I said that this is no bottleneck, and for me the reason is that the design engineers are not doing a quality sufficient job. But that not really their fault. First of all they don't always know how to deliver the correct quality, and second of all they don't have any incentives to deliver the correct quality. So for me the company needs to invest more in the personnel's abilities and motivation. Have a seminar one day in the month, that's 12 days a year. Invest in people and you will get rewarded for sure.

Do you think that the company's managers are selective when choosing people to participate in a project where a customer is involved? In other words, do they select the best people for external projects?

Yes, I think that there is some truth to that. You would wish to give the best possible impression. And in the situation where you have available engineers I feel that the best and these how deliver quality are prioritized.

So that can be a potential reason for the problem?

Yes, it can absolutely be a reason for the problem.

Do you think there is a difference in the motivation for people who work with a customer and people who only work internally? Do you think the people working with customers feel that they are more important than the others?

I think that for some engineers that is the only thing missing for them to really deliver. For some people a pressure like that would be very much appreciated. But people are different.

As a potential area of error we have the scenario that somebody is writing their hours on the wrong project. You have been writing hours for 4 years now, do you put them in the right place every time?

**a little laughter* Well, in some periods there would be difficult to write them to the correct project every time. If I'm checking or approving drawings, then I might not write the hours in the correct project all of the time. A obvious thought would be that when you have a lot of projects in the air, if is difficult to write correct. Whether or not it effects the issue would be difficult to say.*

Do you think that it is a problem that people work on multiple projects at the same time? Wouldn't they then prioritize projects?

Yes, that is a very true assumption. Personally I would definitely prefer to work on just one thing. Gives you more focus and the quality of the work would definitely be better.

So you would say that Well Innovation gives the design engineer freedom to prioritize projects?

Absolutely! But here you would prioritize the project with the project manager that pushes you the most.

What are the good things about Well Innovation?

There are many good things, but if I were to pick one I would say that you as a employee are not really that tied down to one task.

Do you think it is the actual behavior of the customer that puts pressure on the project, or just that aspect of having a customer?

That was a difficult question. But I would say that the behavior of the customer definitely has a effect on the process of the project, but how big this effect is I don't really know.

Do you think that the customer's behavior affects the design engineer directly?

No, not directly, but through the project manager.

11 Appendix B

Interview with Project Manager, 22-03-2011 at 15:00.

Can you tell me a little bit about yourself, your background, education, and so forth?

My name is Øystein Skjæveland and I have an education within mechanical and petroleum engineering. I have a long career from Schlumberger where I worked with QA, HSE, customer relations, Product development and production. I started at Weatherford in 2005, where I worked for 3,5 years with development, systemizing and efficiency improvement of the engineering department. And also as an adviser in the product development phase. Then I went to a small company which developed fiber-optical cables. But I was only there for about half a year before I started here at Well Innovation. At Well Innovation I have had the responsibility of developing a liner hanger system including engineering, testing and production, and also the customer relations. So I would say that I have worked with projects my entire professional career, and mostly in the customer relations position.

Did you start your project manager career in Well Innovation?

No, in Schlumberger I worked with project control and the diverse situations of handling equipment.

You have worked with engineers throughout your professional career, would you say that an engineer is an engineer, or are some engineers different than others?

Like humans in general the difference is enormous. Here in Well Innovation we have some that are very calm, that you have to give a lot of feedback to. If you are strict with them they get nervous. Others can boycott the work if you are too strict. And then you have those that enjoy a good discussion. They have a strong opinion and a strong personality, where you almost have to fight through a discussion that can result in the most fantastic solutions. Then you have those who are idea-machines, very positive all the time and with a good drive. Some are academics and likes to use a lot of time of thinking at issues and solutions. So I would say we have a wide specter of personalities in the engineering department.

Do you think we have mechanisms that motivate the engineers, considering their different personalities?

For me the project manager, but also the engineering manager, have the responsibility of motivating the engineers in the different projects. I like to think that I do things differently than other project managers. For instance, I recently invited the project personnel out on some pizza and beer. I also arranged a party with barbeque, water-skis and other fun activities. This is the way I like to motivate the personnel and build a team.

But don't you then risk your authority? Being too much friends with the personnel?

Well, no. It is about the give and take situation. I know I sometimes ask too much of my project group, but the reason for that is I ask a lot more of myself. And for my part I like to be very active. Checking up on the progress a lot to be updated on the progress all of the time in case of a process can affect another process and so forth. This can for instance be relevant when checking and approving drawings. I have actually experienced that this process takes almost a month! And that really annoys me. So for me, an active project manager is one of the key elements to the product development project's success. But it is also important that you don't yell and shout. Be more of a motivator to build up engineers to perform.

You have been project manager in external projects, but have you been project manager in internal projects?

Yes, I have.

What would you say if the difference?

From an engineer's point of view I would say the external project is more important, and internal project lacks the drive to succeed. "I will not make it today, so I might finish tomorrow or the day after that" would be a typical thought. The drive and desire is not there.

Would you say that this is a result of lack of pressure on the engineer?

Yes... Well, I would say that the pressure is there, but that the engineer doesn't feel it. And when the project manager comes to the engineer with a request the engineer sees this as more of a hustle than actual productive work. And this can cause minor conflicts. Not necessarily, but it might.

Would you agree that the key area of the problem is that an external customer puts more pressure of the project manager because in the situation where you deliver a presentation of the work you are standing in front of a group of unknown educated people and you represent the company to the fullest, whereas internal projects you would present your work to “a familiar face”?

Yes, I would agree to that. But I would also say that the actual importance of the product for the overall business plays a big part in the game as well. If you know that this product, even though internal, directly can affect the life of the company then the pressure would of course be high. And the pressure would be on the project manager. It is his responsibility to communicate the importance of the project to the project personnel.

Interesting, so what you are saying is that the customer effect is not really the key point of the problem, but the importance of the project is?

Yes. Take the Liner Hanger System project as an example. This was originally an external project, but we had the rights to sell the product to others. At a certain point in time we decided to start another project that was meant to improve the cost of the system. Since we had the rights to sell the product, and we had the customer in place, we did this as a strategic move. You could argue that is project was internal, but it had a customer, and it was important. We decided on the 80-20 rule. Do the easiest 80 % of the cost improvement first, and leave the last 20 % for later. This was badly communicated to the engineers. And the engineers did not get importance of the situation. I will take responsibility of the situation, but I also think that the CEM should have done a better job in communicating the importance to and motivating the engineers.

If you were to put your finger on the one thing that needs to change considering the situation, what would it be?

I would say the motivation of the engineers, but also communication of the importance of every single project.

Who has the responsibility of this, the project manager?

I would say yes, but not only. I would split the responsibility to both the project manager and the CEM. But also the management in general has a responsibility of motivating the personnel.

I would also address that there are good and bad engineers, so some will sadly always be underachievers.

Do you think that when choosing the engineers to work on external projects you would choose the best, and leave the others to internal?

Yes and no. We have one internal project now where, from my point of view, one of the best engineers, are working. But yes, for some internal projects we use those engineers that do not always deliver quality.

Do you think that the role of project manager should be separated from the design engineer?

No, I think that a design engineer can be a good project manager. And I think it is a must for a project manager to be able to use the design tools and have experience from the product development on the design level and also production, especially when customers are involved. And I think that one of the strengths of this company that some of the project managers also work as design engineers. And really there are few administrative tasks for the project manager on minor product development projects. But to work as a project manager on multiple projects your situation would be different.

Of course not every design engineer can be a project manager. And there are those that wants to be a project manager, but maybe don't have what it takes.

But do you think that, from a design engineer's point of view, the pressure to deliver to another design engineer that something has the project manager role would be lower than delivering to a person who's position is a project manager? Maybe he/she is on a different floor?

Well, if the project manager is organized away from the engineers, for instance on a different floor, then I think that the pressure to deliver would be higher, even though it should not be like that. But the roles should always be clear.

Would you say that the customer's activeness is affecting the projects efficiency?

Yes, if the customer is not active, the project manager might not be as active, which again makes the engineers not so efficient.

12 Appendix C

Interview with CEO, Stein Danielsen, 22-03-2011 at 14:00.

Can you tell me a little bit about yourself, your background, education, and so forth?

Yes, very good. My name is Stein Danielsen and I am CEO of Well Innovation. I have a master degree in Business and Economics with specialization in project steering and mainly the big finance and economic courses. As for my professional background I have worked for the big oil and gas companies for many years, first as business analyst and eventually as manager for different parts of the organization in Schlumberger. After Schlumberger I worked 5 years for Accenture as manager for different economics departments and also as consultant in BP. Worked both nationally and globally in many projects. And after a trying different things I must admit that having a leadership role is what suites me the most.

Were you in Well Innovation from the beginning?

No, I came in after a year. When Well Innovation had grown from 2 people to 12-13 they had a need for a professional management to build structure and build a professional organization. Now the company has about 60 employees.

From your point of view, how was Well Innovation when you arrived?

Well Innovation was a business with few systems and a very bad project control unit. There was a lack of commercialized thinking; a product was going to be developed no-matter-what the cost. There was also no evaluation processes after the projects and in general very few systems. The engineers were proud and stubborn and because of that some projects were actively worked on but really were not going anywhere. The projects also reflected bad planning from my point of view.

What type of projects did Well Innovation have back then?

Often the projects were related to concept development. Where you have a customer that wants to check something out, find an answer to something. And you would get a contract of a small amount of money to make a concept to see if something was possible. Some projects were taken to the next level where you got into more detailed engineering. We had a project that got a lot of media coverage, called Badger, which drilled on the sea bed to reach the oil reserves. We did the concept, and the owner got NOK 300 million in funding because of the quality of the concept, which we are

very proud of. Most of the projects where we developed a concept for a customer were based on hourly payment, and that gave us really not a big need to control the projects because that was the customer's responsibility. In project with fixed price you have a need for project management, but we didn't really have much of that in the beginning. It was only after a while we had the need for project management though. Lastly you had the third alternative which was internal product development, where often engineers were in control, and they were very motivated and proud of the product. The sad thing is that was projects that really took way too long to finish.

Is it correct that Well Innovation started out as an engineering company and at one point in time decided to start the development of its own product portfolio?

Well, no, to develop a product portfolio was actually the founder's idea from the beginning. But to cover that cost we did development projects for others. Cash flow from concept studies and other hourly based projects for customers such as Seabed Rigg, AGR, Badger, Reelwell, all of whom has become successful companies in the aftermath, was financing Well Innovation's product portfolio. So to answer your question, once the cash flow was there we started development of our own products. Also one thing we did was to contact the big oil and oil service companies and ask for financial backing in the terms of substituted prices but Well Innovation would be the owner of the product. We didn't want to be a consulting business, but a production company with our own products.

With respect to the problem, where did you first discover that internal projects were not doing so well?

I started to look in to the projects, and got really annoyed because it seemed to me that the engineers when working on internal projects had the attitude "There was still a problem, so I need to just continue working on it". And the cost was building, re-machining, more testing, back and forth all the time, not going anywhere. And it was obvious to me that we needed a much better process in the planning phase of the projects. We then initiated strategy meetings with lead engineers, and other relevant personnel to make some key decisions on what the customer wants, what is interesting to work on, Is it technical possible to finish, how many hours was needed and so on. This was also done to give the engineer the understanding that if he/she doesn't deliver on what he/she promises then we would cancel the project on a much earlier stage then before.

From your point of view, what is the root of the problem?

For me it is about responsibility and understanding. If the engineers responsible do not adequately know what he/she is responsible for then you have a bad situation. A problem we have is that our engineers want everything perfect. Every single detail of a product needs to be perfect for our engineers. But they don't really think about the cost vs. gain concept that you have to keep in mind. Don't choose the most difficult solution first, but prove that it works first in an easy way for instance. Very often you would have a too detailed first concept and too much work on something that might not work at all. For me, that is like making a space shuttle when all you need to succeed is a small plane.

Well Innovation is a growing company; do you think that a reconstruction of the organization is overdue?

Well, there is absolutely no doubt that a growing organization like Well Innovation will experience organizational challenges. And at a certain point in time you need to go into new organizational phases. Now, with the order reserve we have today, we are looking to strengthen our squad, especially in project management. But it is important that we don't hire too early, with respect to maximum profitability.

With respect to the thesis focus, have you considered re-structuring the company in a way so that there always will be a customer, only internal?

Well, we actually just did that a few months ago. We established a product company that we called "Well Innovation Products".

But does it mean that Well Innovation Products will act as the customer? And be just as critical?

It really depends on how you organize "Well Innovation Products". If "Well Innovation Products" always owns the products, then yes they will act as the customer. But if Well Innovation Products is split even more, for instance in Completion, Intervention, N & A, then they will not act as the customer before the product is finished and ready for commercialization. We have done this many times now and our experience tells us that the earlier you would establish a company with its own customers the better it works out.

It is pretty obvious that the customer effect is there, and that it creates pride and excitement on the project manager to deliver. But would you agree that this effect is not as strong when a project manager delivers to an internal customer?

Well Innovation Products is physically placed in another floor in order to get the two departments apart. And for me it is obvious that the design engineer or project manager does a better preparation when an external customer is involved, and yes this is probably the one reason you could highlight. So the solution is quite classical; have formal meetings for presentation and planning. And highlight the problem to the staff, basic coaching.

So yes, a very important point and I agree to the fullest.

What about competitive tendering of the engineering department?

It's not allowed.

Can you organize the business so that it is allowed?

No. This is a bitter experience we've had, and the most important principle is that everything must be kept within reach. If you have a part of the organization that suddenly have a different label than the rest, and they say that they are not happy with the engineers, so they want to hire their own engineers, then that is a no. We don't want to make a new engineer group. The backbone of Well Innovation will be Engineering, Machining and Testing, and the goal is to produce spin-offs from this backbone that is the underlying business strategy. That is one reason. Another reason is that it would not be healthy for a organization of this size to create that kind of environment. Also it is important that the prices between the departments are on a market level, otherwise this would not have worked.

Lastly I must say that for me the problem lies in the lack of seriousness in the internal project management. Would you agree?

Yes, and I suggest that when you are going to present your work there should be an almost "stupid" process with a checklist that the presenter fills out; Have I done this? Have I done that?