Radboud Universiteit

The change in the organizational- innovation-structure and its influence on the ability to innovate

A qualitative case-study in the manufacturing industry regarding CtO and EtO production process business models

MASTER THESIS

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| Preface

In front of You is the master thesis, which is written following the completion of the master's program Organizational Design & Development at the Radboud Management Academy of the Radboud University Nijmegen. The research topic of this study is the influence of organizational- and innovation- structures on the innovative ability of a CtO and/or EtO structured organization. Writing this thesis was challenging, yet interesting to see its findings and recommendations. Now, June 13th, this thesis trajectory comes to an end. I hope that the results of this master thesis research will make a positive contribution to the organizational-innovation- structures and their ability to innovate at Movexx International B.V.

| Abstract

Innovation in the manufacturing industry will always be present for the survival within the competitive market. So, it is important to have a good foundation for maintaining or improving your innovative ability. Process methods of producing products can therefore play a significant role and comes in numerous of forms. The focus of this research paper is on the Configure-to-Order (CtO) modular process method, in which it makes possible to interactively design a product by specifying which parts should be used in the final product (Edwards & Pedersen , 2004). And the contrary process design principle of Engineer-to-Order (EtO). EtO is a process of designing unique products for specific customers which might be time consuming and labour intensive. The different structures can ensure a different execution of the explorative and exploitative innovations, what might jeopardize the viability of an organization. Hence, this study researched the organizational- innovation structures of CtO and/or EtO process business model and what kind of influence it is having on the innovative ability of an organization.

The study is performed in a deductive qualitative manner, with the aim of diagnosing the organizational- innovation structure. Therefore, a single case-study was conducted at Movexx International B.V. First, existing knowledge and theories related to the topic were reviewed in the theoretical framework. Secondly, the methodology is explained to discuss the execution of the analysis. The analysis was done by conducting nine semi-structured interviews and by reviewing organizational- innovation related documents. Finally, it was possible to write down the results and recommendations with the help of the Lowlands Sociotechnical System Design (L-STSD) principles of De Sitter (1994), and the 'Model Innovation and Organization Structure' (MIOS) developed by Lekkerkerk (2012). These two models do give a comprehensive representation of the organizational- innovation- structure at Movexx International.

The results of this research paper showed that the organizational- innovation structure at Movexx International does influence the innovative ability. A few design parameters (De Sitter, 1994) indicated that the organizational structure might be problematic. Furthermore, different functions within the innovation structure are informally present and function problematic. Hence, Recommendations are made for lowering the problematic parameter values and to formalize / improve the MIOS functions. As a result, it might create a healthy balance between the explorative and exploitative innovations.

Keywords: Innovation, organizational- innovation structure, innovative ability, CtO, EtO, L-STSD, MIOS, ambidexterity, creativity, and renewal.

| Acknowledgement

I would like to thank the people who supported me through the process of writing my master's thesis. A special gratitude goes out to my thesis supervisor Dr. ir. L.J. Lekkerkerk for his guidance, support, and expertise in writing a master thesis. His input and feedback did ensure the quality of this study.

Furthermore, my gratitude go to Movexx International B.V. In particularly C. van Rekum, who guided and supported me during my time at Movexx International. I have always felt welcome, and I was able to do my research under good circumstances.

Finally, I would like to acknowledge my family who have been understanding and supportive with the process of writing my master's thesis.

Nijmegen, June 13th, 2022

J.J.W. van der Huizen

| Abbreviations

AtO	:	Assemble-to-Order
CAD/CAE	:	Computer Aided Design / Engineering
CIO	:	Chief Innovation Officer
CR	:	Change Request
CtO	:	Configure-to-Order
EtO	:	Engineer-to-Order
ICT	:	Information and Communication Technology
L-STSD	:	Lowlands SocioTechnical System Design
MIOS	:	Model Innovation and Organization Structure
MT:	:	Management Team
MtO	:	Make-to-Order
MtS	:	Make-to-Stock
NCR	:	Non-Conformity-Reports
PRG	:	Product Review Group

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| Chapter 1: Introduction

Today, many manufacturing companies might use the engineer-to-order (ETO) design principle, with each order being redesigned every time. This process of designing unique products for specific customers can be time consuming and labour intensive. According to Seiler, Greve, and Krause (2019), the combination of individually designed products with a high degree of complexity/component diversity and the fact products are manufactured in only very small batch sizes, creates an increase of costs in all the product life phases. Therefore, we see that many manufacture companies are switching from Engineer-to-Order modular systems (EtO) to Configure-to-Order modular systems (CtO). As a result, these CtO modular systems might decrease the manufactures costs and internal variety/complexity of products. While at the same time keeping up with the high external variety demands of products. A CtO modular system makes it possible to interactively design a product by specifying which parts should be used in the final product (Edwards & Pedersen , 2004). Moreover, it is a system of describing relationships between individual parts of a product.

Innovation is an important concept within the EtO modular systems. Manufacturers with an EtO modular system need innovative solutions for many customers to meet their specifications (Bertrand & Muntslag, 1993). Therefore, the organizational structure of a manufacturer should be designed in such a way that it enhances the innovative abilities to remain viable. Hence, for the change towards a CtO modular system, the change in the innovation structure is inherent. According to Edwards and Pedersen (2004), the main difference between the innovation design structure of an EtO modular system and a CtO modular systems is that the process of innovation for EtO modular systems is done in the engineering phase of the customer orders. Where for a CtO modular system innovations mainly revolves around the process of customer orders and are done by the research & development department (R&D). Thus, it might be considered that employees of the production/order process do not have to worry about innovations anymore when a CtO modular system is implemented.

Damanpour (1991) argued, ‘‘Innovation is a means of changing an organization, whether as a response to changes in its internal or external environment or as a pre-emptive action taken to influence’’ (Damanpour, 1991, p. 556). Companies should respond and adopt new innovations to react to the continuous changing environment. The adoption of innovations will improve the strategic performance of companies. Although, most of the people think about technological innovation, there are other kinds of innovation types that can be distinguished.

According to Armbruster et. al. (2008), there are five different types of innovation namely: new products, new production methods, new markets, new sources of supply and organizational innovations. The organizational innovations are going beyond the technological innovations. This type of innovation is concerned about the non-technological processes within a company. Moreover, it is searching for new innovative ways of (re)structuring the company into a profitable organization with a competitive advantage. The organizational innovation of (re)structuring organizational processes can be reflected on the change in systems into a modular, and scalable design namely; CtO. So, when the change is being made from an EtO modular system towards a CtO modular system, the same innovation mechanism might not work anymore. CtO modular systems asks for a different kinds of production processes and will not have the need for customer specific innovation solution. As a result, the company does not necessarily need to have the same innovative mindset and structure. Therefore, it raises the question how do CtO organizations organize their innovation projects or processes?

For studying the organizational and innovation structure, Movexx International B.V. is the company of interest. It is a manufacturing company, located in Veenendaal, that provides compact, extremely user-friendly electric tow aids with which roll containers and other rolling transport carts can be transported very easily and without physical strain (Movexx, n. d.). Their vision for the future is to use a product configurator and work according to the CTO principles. Today, Movexx International has integrated a CtO modular system for 75% within their production processes. The remaining 25% is still dedicated to customer specific order that can be classified as EtO. In addition, they do not have concrete and clear insights into their order/production processes with the associated innovation structures. Due to that, it is particular interesting for this paper to study the case of Movexx International for the differences in innovation structures between EtO and CtO modular systems.

1.1 Objective and research question

The objective of this deductive qualitative research is to identify the organizational- innovation-structure of a CtO modular system and compare it to the EtO modular system. Movexx International will get an insight of their innovations related to their organizational structure. Recommendation will be formulated about their innovative abilities and how they can optimize their structure of organization and innovation. This objective will be achieved by elaborating on the different innovation projects within the EtO and CtO modular systems, how innovation is structured in an EtO and CtO modular system, and by identifying the decreasing or increasing innovative ability of an organization when using a CtO modular system. Therefore, the aim is

to diagnose the organizational innovation structure of Movexx International, with the help of the 'Model Innovation and Organization Structure' (MIOS) developed by Lekkerkerk (2012). This model is a normative model. It means that when functions are allotted in an organization, the functions or positions are occupied by competent people and the mutual coordination is arranged, this organization is and remains viable. MIOS is created as an addition to the Lowlands Sociotechnical System Design (L-STSD) approach initiated by De Sitter, (e.g. De Sitter, Dankbaar & Den Hertog, 1997). This approach of (re)designing organizational structures includes the use of a control and a production structure. This structure consists out of the basic activities of strategic regulation, regulation by design and operational regulation (De Sitter, 1994). MIOS is a model within the regulation by design. As a result, it might create a better manageable structure for innovation. Lekkerkerk argued (2012), when the organization is structured well the innovation efforts can also be improved. Moreover, to examen the structure of innovation at Movexx International, the primary process of the organization must be included in the diagnose. Hence, the following formulated research question will have to be answered;

''What should change in the organizational- innovation- structure of Movexx International when it moves from an Engineer-to-Order (EtO) business model to a Configure-to-Order (CtO) business model and what is its influence on the innovativeness?''

The related sub questions are;

- What is an organizational- innovation- structure?
- What are the innovation projects and structure within an EtO modular system?
- What are the innovations projects and structure within a CtO modular system?
- What are the differences of innovations between EtO and CtO modular system?
- How to deal with the decreasing or increasing innovative ability when changing to a CtO modular system?

The empirical sub research questions are;

- How does the organizational- innovation- structure at Movexx International look like?
- How does the organizational- innovation- structure of Movexx International affect the innovative ability?
- What recommendations can be given reflected on the organizational- innovation- structure at Movexx International?

1.2 Relevance

Specifying the outcomes of the production process method, and their structure for innovation, contributes to the knowledge of innovation and organizational structure in the manufacturing industry. A paper presented by Lekkerkerk at STS-RT-conference in Louvain, Belgium (2015), suggested that there is a relatively limited number of cases that specifically researched the organization of innovation in a manufacturing company. Especially, it is lacking of research about the innovation structure of a CtO modular systems design within the manufacturing industry.

1.2.1 Scientific relevance

The scientific relevance of this study consists of the following components. First, innovation structures and CtO modular systems are known (research) concepts in the available literature. Nevertheless, the connection between these concepts is missing in the field of innovation and organizational design. The influence of a changing production process method is inherent to the structure of innovations within an organization. Slaughter (1991) suggested this as a topic for further research. ‘‘The importance of innovation for the integration of components relative to the standardization of the connections’’ (Slaughter, 1991, p. 93) . Moreover, the innovation structure of an organization might be suppressed due to the changing business model and modular system. Secondly, different types of organizational methods will be used to diagnose the structure of Movexx International. Namely, the Lowlands Sociotechnical System Design by De Sitter, Dankbaar and Den Hertog (1997) and ‘the Model Innovation and Organization structure’ by Lekkerkerk (2012). Which is part of the L-STSD body of knowledge. These models and their concepts are well known in the literature. Therefore, it is relevant for science to see how these models are being used and tested in practice. Thirdly, the innovation efforts within a company when changing to a new business model (changing to a CtO modular system) will be studied in the form of a single case study. This empirical research method will create new knowledge for the literature of innovation structures and design. It is focused on getting a detailed description of stability and change to identify the variables for the potential explanation of the processes. Whereby descriptions and models are being tested through the use of discussions, interviews and observations (Vennix, 2019). Furthermore, this method will gain concrete, contextual and in-depth knowledge about this specific topic. Relevant characteristics, meanings and implications of the case are explained in this study within its real-life context.

1.2.2 Practical relevance

Due to the use of a single case study, the practical relevance of this study is obtained from the results and recommendations. From this managerial perspective, Movexx International will get an overview of their potential innovative abilities and their structures. It helps to understand the importance of an innovation structure and their efforts within the company. Secondly, the innovation structure of Movexx International will be visualized and elaborated on to see what the positive aspects are, but also to see if there are possible points of improvements. The connection between the innovation abilities and their structure will be reviewed. As a result, Movexx International is able to see how the company is improved or what the potential drawbacks are. To conclude, the result of this study can be generalized to other manufacturing companies. Organizations that are changing to a CtO modular structure can use the results of this study for their desired innovative ability when implementing a CtO modular system.

1.4 Thesis outline

In the first chapter an introduction to the topic of 'CtO modular systems and organizational-innovation- structures' was given. Chapter two gives a description and an outline of the relevant theories/perspectives with regard to the identified problem. Furthermore, a conceptual framework that reflects the problem is created to visualize the definitions and concepts within its literature. Chapter three describes the research methodology to explain the used methods, sample, data sources and measurement levels of this study. Additionally, it will indicate the data analysis procedure, the limitations and research ethics for the quality of this research paper. In chapter four the analysis and their result will be described from the collected data. Thereafter, de results of chapter four will be discussed and concluded in chapter five. To finalize the conclusion and discussion the practical implications, reflection, and recommendations are given. Which also includes the possible suggestions for further research.

| Chapter 2: Theoretical framework

To understand what should change in the organizational- innovation- structure when a change of modular system is happening, it is fundamental to obtain discernments about the general concepts of innovation, CtO & EtO systems and innovation structures. To be specific, the widely amount of definitions and concepts will be discussed. Furthermore, two of the important models (MIOS and L-STSD), that are relevant for this study, are being explained. These models will include the innovation efforts of the structure within the organization. Finally, a conceptional model is visualized to give a clear illustration of the used theories and their concepts.

2.1 Defining innovation

Before elaborating on the different aspects and models of the organizational design perspectives on innovation and process systems it is important to have a comprehensive definition of innovation. The definition of Crossan and Apaydin (2010) corresponds with the overarching aim of this research paper. They explained innovation as;

‘‘Innovation is: production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems. It is both a process and an outcome.’’ (Crossan & Apaydin, 2010, p. 1155)

This definition concerns several aspects that are of importance for the concept of innovation. Nevertheless, for this research it is too broad. This study will mainly focus on the last parts; ‘development of new methods of production and the establishment of new management systems’. Lekkerkerk (2012) argued innovation in the organisation literature as ‘‘Innovation includes project-based development and realization of both technical such as organizational or social innovations and policy management of it’’ (Lekkerkerk, 2012, p. 279). He indicates that innovations are always project-based. But, if the innovation is not appointed as a project it is referred as continuous. Moreover, “ ‘Improve’ (or kai-zen) everyone has to do it continuously and sometimes it is innovative, but the implementation does not take place on a project basis, it remains within a department and usually does not require formal approval.” (Lekkerkerk, 2012, p. 279).

2.1.1 Defining organisational and innovation structures

As it already was mentioned in the introduction, 'the development of new methods of production' is referring to the emergent use of CtO modular systems in the manufacturing industry. So, in this research 'the development of new methods of production' is defined as the innovative change of how manufacturing companies make their products. Moreover, production process designers of a manufacturer will find novel solutions to shape the production into a scalable, less complex and costs saving manner. 'The establishment of new management systems' refers to the organizational structure for innovation. When changing the 'method of production' the structure of the organization will change inherent, together with the structure of innovation. Therefore, this research defines, for 'The establishment of new management systems', both the organizational structure and the innovation structure. First, De Sitter (1998) explains the organizational structure as;

''An organizational structure is created when you complete a total task (a primary process) divided into sub-tasks. The production and regulatory work is divided among people and machines and that is called division of labour. We also call it organization. So division of labour and organization are different words for the same." (De Sitter, 1998, p. 91)

It is enhancing the idea that structural (re)design of an organization is a technological and social principle. It refers to the divided tasks and regulatory work between people (social) and machines (technological). In the literature a comprehensive definition of an innovation structure is not present. Nonetheless, De Sitter (1994) argued that a good production structure positively increases the innovative capacity of an organization and that the structure of innovation must subsequently be connected to the production structure. Moreover, the innovation structure is a structure with functions that are linked to the production structure, which is considered as a 'control activity', with explorative and exploitative innovations (Lekkerkerk, 2015). These explorative and exploitative innovations can be considered as radical and incremental projects. Therefore, it is need of being controlled. Otherwise, through the eyes of a sociotechnical, innovation performance might be negatively influenced by a complex production structure (Lekkerkerk, 2015).

In summary, Innovation is a broad concept with several aspects that are explained by Crossan and Apaydin (2010). For this research, 'development of new methods of production and the establishment of new management systems' are of importance and which is linked to the organizational and innovation structural design.

2.2 Innovation in the organization

Innovation is more than just great ideas. According to Zairi (2011), ‘‘It is often recognized that innovation comes through 10 per cent inspiration and 90 per cent perspiration’’ (Zairi, 2011, p. 21). It is a systematic experimental process of trials and errors with different concepts and characteristics related to innovation. Moreover, innovation is a broad term that is studied in a variety of disciplines and theories. Management scholars argue that, the capabilities for innovation are the most important determinant of the firm’s performance and for their ability to innovate (Crossan & Apaydin, 2010). The ability of an organization to innovate is defined by De Jong , Kemp, and Snel (2001) as ‘‘the ability of an enterprise’s employees to generate ideas and to work with these ideas to develop new or improved products, services, technologies, work processes or markets’’ (De Jong , Kemp, & Snel, 2001, p. 13). There are articles that review innovation either from a level perspective namely; individual, group, firm, industry etc. Or at a type of innovation perspective namely; product/service, process and business model. For the survival and growth of a company it is important to consider both perspectives. They are conceiving external adopted innovations and internal entities for the improvements in the organization, which can be acknowledged as the innovative ability of an organization. According to Bilton and Cummings (2010), the different levels of innovation are inherent to the concept of ‘creativity’. Whereas the different types of innovation are connected to the ‘renewal’ of an organization. Creativity within the individual, group, firm etc. can be recognized as the first stage in an innovation process. This human capital of skills, knowledge and experiences in organizations will enable the necessary renewals at a product/service, process or business level. Therefore, this research is considering ‘creativity’ and ‘renewal’ as the abilities of an organization to innovative.

The ultimate goal of an innovation within an organization is to improve the company’s performance, by increasing customers’ demands and decreasing costs. In the manufacturing industry most of the innovations are product or process based. Lekkerkerk (2012) argued, with product innovation an organization hopes that existing or new customers will add as much added value to the innovation that they want to purchase it. With the creation of a new product the profits might increase and it could be a source of market advantages. Process innovation within the manufacturing company is considered as a transformation of the primary process (Boer, 1991). For example, the transformation of Information and Communication Technology (ICT) or Computer Aided Design of Engineering (CAD). These product and process innovations will also have an effect on the organizational- innovation- structures. The newly integrated products or processes will change the production structure, regulation structure and

information structure within an organization. This change in structures can be considered as non-technological innovations. Nevertheless, some changes to the organizational structures may have a technological component. For example, a simultaneously supporting ICT program (Lekkerkerk, 2012). Therefore, the changes of technological systems within a company, that are using technological components, will introduce changes to the organizational structure.

Since changes in the technological systems, as a result of innovations, create changes to the organizational structures, it is interesting to consider the degree of novelty regarding the innovation efforts within a company. Lekkerkerk (2012) argued, knowing the degree of novelty will enable the decision to choose the right process, product or organizational innovation. The novelty of innovation can be distinguished into radical and incremental innovations. Radical and incremental innovations are usually done on a project-to project basis with each project having their own business case. Radical innovation mostly represents something fundamentally new to the market and to the business model of the organization. These innovations must be formally approved by the innovative board or higher management and have an experimental/prototyping approach (Lekkerkerk, 2012). The incremental innovations are showing a lower degree of renewal. It represents the small changes to the existing processes, products and business model. These innovations are mostly executed to increase the competitive advantages and to decrease the operational costs. Incremental innovations are mainly conducted within and by the departments alongside their daily work with no involvement of other departments.

The distinctive novelty of innovation is comparable to the commonly used paradox of ‘exploitation and exploration’. Exploitation is about exploiting the existing products to enable incremental innovations, whereas the exploration is about exploring new opportunities to increase the more radical innovations (Andriopoulos & Lewis, 2009). Because literature is repeatedly warning about the difficulties of managing exploitation and exploration tensions, organizations will therefore approach the incremental and radical innovations separately from each other. As a result, deterioration of the innovation abilities might increase. According to Gupta, Smith and Shalley (2006) ‘‘adaptive systems that engage in exploration to the exclusion of exploitation are likely to find that they suffer the costs of experimentation without gaining many of the benefits’’ (Gupta, Smith, & Shalley, 2006, p. 697). Therefore, organizational ambidexterity might be prized as a means of managing the tension between exploitation and exploration. With organizational ambidexterity the organization uses adaption to achieve persistent success in their innovation abilities. To be more specific, the organization is seeking

for the incremental and radical innovation at the same time and will not integrate them separately. This will increase the ability to fulfil the customers' demands in the field of innovation.

2.3 From EtO to CtO

''Design as a 'function' is the critical link in the innovation chain, it is the opportunity of linking customer wants into the organizational how'' (Zairi, 2011, p. 22). With this phrase it is clear that manufacturing companies today consider a shift from an EtO system to a CtO system. This method or ideology was first elaborated on in the 80's by Davis and Davis (1987). In their book 'Future perfect' they explained, after their research at the business universities Harvard and Boston, that Mass customisation is important for the evolution in the information economy what is impacting the manufacturing industry. After they conducted the research about this principle of mass customisation, many other authors started to investigate more perspectives within this concept. As a result, the CtO systems approach is an increasingly emerging method for the manufacturing industry.

The Different process methods

There are numerous of different modular system design approaches for manufacturing products. These modular process methods are characterized by five gradual dimensions namely; 1) decoupling, 2) functional binding, 3) interface standardisation, 4) commonality and 5) combinability (Salvador, 2007). The degree of each of these characteristics can distinguish the degree of modularity of a product. Therefore, Kilger and Stadler (2015) explained that during the design/production, the production processes can be divided upon their earlier mentioned characteristics, the degree of product development, completion and customer orientation. Moreover, researching all the characteristics and the degrees of products created the classification of the product process as 'anticipative or reactive'. In figure 1, an illustration is given of the two classifications and their production processes.

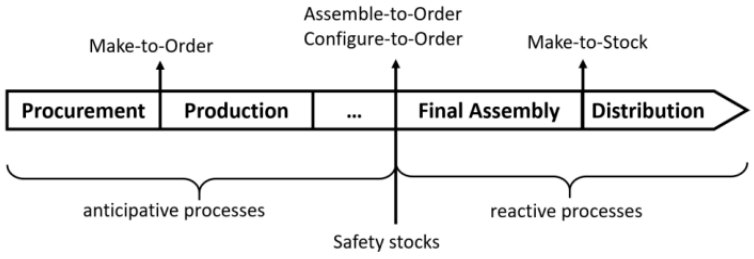

Figure 1: The production process classification (Kilger, Stadler, & Meyer, 2015)

An anticipative process can be described as a more customer-individualised product development, design and manufacturing. These are typically approaches that are called Make-

to-Order (MtO) or EtO. In contrast, the process of Make-to-Stock (MtS) is visible. This process is reactive and it is well known for its 'Bulk items'. To be more specific, the already manufactured products are being stored in a warehouse were they stay until a customer buys it. In the middle of those two production process approaches we have the Assemble-to-Order (AtO) approach and CtO. This process is equally present in the anticipative classification and in the reactive classification. In line with the production process classification by Kilger and Stadler (2015), Jensen, Lidelöw and Olofsson (2015) explained the movement from an integral to a modular product architecture. In figure 2 the trade-off between the common parts of a product and the unique parts of a product are visible.

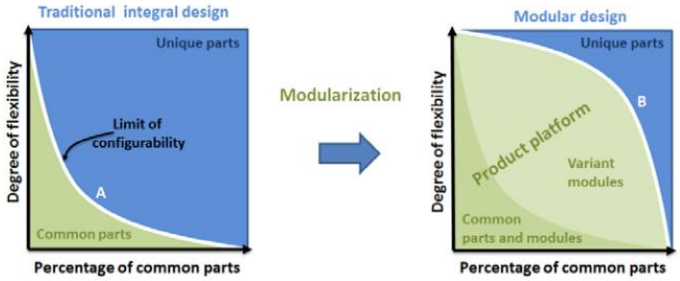

Figure 2: The movement from an integral to a modular product architecture by Jensen et al. (2015)

This illustration makes it clear that an EtO modular is a traditional integral design with a curve that is low on common parts and high on unique parts. This situation is only economic in the select-variant situation (Jensen, Lidelöw, & Olofsson, 2015). Whereas, the CtO modular is a modular design with a curve that is high on common parts and low on the unique parts. ''In this way, economies of scale can be achieved'' (Jensen, Lidelöw, & Olofsson, 2015, p. 79). The main difference between the two curves is that in curve A product designs are project-specific. Whereas curve B, product designs are intended to satisfy the functional requirements of the intended modules.

For a better understanding of the production process modulars the different modulars will be individually explained. As a result, the elaborations will also illustrate the difference in anticipative and reactive processes. This research is focused on the EtO modular system and CtO modular system. Therefore, it will not explain the principles of MtS in detail.

Make-to-Order (MtO)/Engineer-To-Order (EtO)

MtO and EtO are two anticipative modulars that are closely linked with each other. The only major difference is that with MtO the manufacturer obtains very few high level material until it received the customer's order. Whereas with EtO it also obtains very few high level material until it received the customer's order, but the material and development is more consumer

specific. Bertrand and Muntslag (1993) argued, an EtO modular approach is characterized by three aspects. Namely:

- ➔ By their 'dynamics', which entails that a manufacturing company need to anticipate on the considerable fluctuations of orders. The fluctuations can be predictable. Nevertheless, it is still very difficult to anticipate on. The mix of fluctuations between orders asks for external flexibility to cope with as an manufacturer.
- ➔ By their 'uncertainty', which entails ''the difficulty of the differences between the amount of information required to perform a task and the amount of information that is already available in the organization'' (Bertrand & Muntslag, 1993, p. 6). This is mainly concerned at the start of the project process, the parts that are necessary for the configuration is mainly unknown. Therefore, it results in a more complex process of manufacturing the product.
- ➔ By their 'complexity', which entails the flow of goods, the multi-project character and the assemble structure. The components of a product that are specifically for one customer is bringing more complexity to the internal structure. This means that the design and assembly operations is taking place in certain specific locations for the specific product. Therefore, it might be difficult to plan different assembly activities within the manufacturing company.

In a situation where EtO is active, every product is one of a kind. The customer must have a relation with the assembly/order process of the manufacturing company. Therefore, communication between the corresponding departments and the customer is an important factor to consider within an EtO modular. For the manufacturer, EtO is a modular system where there are no boundaries. In the process, which is specified over and over again, a lot of energy is involved in establishing the specifications. As a result, EtO provides a lot of data to maintain, different software packages and every time new work preparation tasks within its supply chain. In figure 3, a general EtO process is visible. This illustration makes clear that every customer has their own specified engineered product, with a specific assembly process. As a result, the variety and complexity of the products are high.

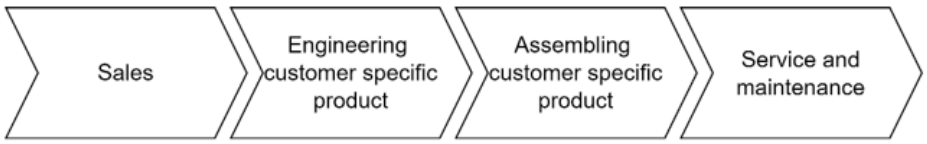

Figure 3: A general view of EtO modular process

Assemble-to-Order (AtO)/Configure-to-Order (CtO)

Between the anticipative and reactive production process modulars, the AtO and CtO modulars are visible (see figure 1). The only difference between them is that CtO modulars are just designed, whereas AtO modulars are already built. They differ in the degree of completion (Seiler, Greve, & Krause, 2019). Nevertheless, for this research the focus lies on CtO modulars. CtO is implemented in a manufacturing company when pre-specified modular building blocks with which an "infinite" amount of variants of a product can be configured. As a result, the environment that is created within the company is one where you allow customers to configure the product with a variety of finished material choices that they can choose from and that suits them (different-stocking-strategies, 2013). According to Minjoo, Stein, and Chung (2018), the CtO modular process is a bottom-up approach. Prototypes are being created by a Research and development/design team for the configuration of predeveloped standardized modules. It is a process that is based on the design selection at the time the customer is ordering the product. Due to this, development time and costs for manufacturing new product will reduce. Also, manufacturers are able to quick succession of customers' requests due to less pre-engineering and prices being known. Moreover, clear and error-free information flows will occur because it is predefined. Nevertheless, if the customer-specific adjustments are allowed to be made during the production of the standardized product the CtO principle will fall apart and the company will not reap the benefits. In figure 4, a general CtO process is visible. As you can see the step of engineering customer specific products is removed. Therefore, the Research and development department (R&D) has been introduced. This department is constantly seeking for innovations, improvement and flaws within their configurations. all to meet the demands of their customers.

When implementing a CtO modular system, the manufacturing company should not think that this decision is only applicable for the production departments. They should not underestimate this business approach. Seiler et al. (2019) argued, this fundamental business choice will change every department. During the implementation it is necessary that all stakeholders within the company are committed to this change. Therefore, be transparent and communicate with the stakeholders, ensure support throughout the organization and beyond.

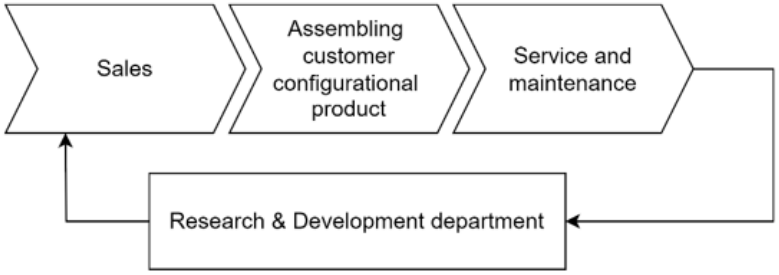

Figure 4: A general view of a CtO modular process

2.4 Innovation within EtO

Manufacturing companies, that are using an EtO modular system, reacts to their markets in a unique way (Hicks, McGovern, & Earl, 2000). It is designing products based on the unique customer specifications. Therefore, it is required to have an accurate change and innovation management system throughout the production process. Within this EtO production process new components are continuously being (re)designed. Hence, the complex and high variety of customer specific products. Furthermore, it is important to monitor and asses the process of production because changes are happening a lot within this process. According to Karl (2019), there are four basic workflow steps to consider within an EtO modular system approach:

- ➔ *Sales engineering:* Here, the customer clarifies the specific functions and deliverables that require for the finished product. The sales staff is working closely with the product engineers to meet the targets of the customers. To establish a desired configured product for the customer, this process is characterized as iterative. There is a constant communication between customer, sales and engineers.
- ➔ *Process planning:* This process includes the design of the products assembling, that entails the ordering of unique/common parts , production schedules, associated costs and documentation of the process. Also, it should be considered that the customer specific products are flexible enough to allow manufacturers to stay within its production capacity and stay within the planned cost level.
- ➔ *Inventory management:* Since EtO products often require specialized components that cannot be used in other products, accurate inventory management is critical. Both to prevent specialized parts from being misused for applications and to keep professional production lines and production schedules on track.
- ➔ *Manufacturing:* EtO assembling is manufacturing with new iterative and or new unknown product variables. This will cause changes to the assembling line. Change in orders are happening which may require adjustments to the production line process at one or more locations in the factory.

In these workflow steps, innovation comes within any of the steps. These innovations are not only product based but may reveal incremental and/or radical innovations to the process of manufacturing a product. Therefore, ambidexterity is present for the balance between exploitation and exploration. It is considered as an iterative process that includes the cooperation between the customer and the different involved departments. As a result, it can be concluded that the innovative abilities within an EtO modular system are continuously, highly

present, and executed with cooperation between different actors. A lot of members of the organization are involved within this process of innovation.

However, a drawback of innovation within an EtO modular system is that there is no time to focus on a broader part of the process and product innovation. Products have to be continuously designed, and therefore it becomes difficult to transfer knowledge and gain an edge over competitors (Bertrand & Muntslag, 1993)

2.5 Innovation within CtO

As it was explained earlier, a CtO modular system is a bottom-up approach with standardized products that can have specific specifications that are pre-made by the research and development/design team. This will improve the production flow, service offering, product volumes and the production costs. Therefore, it can be considered that the innovative abilities of a CtO manufacturer, due to the standardized product configurations, is lower than in an EtO manufacturer. Nevertheless, the automatization of configural products creates more time for the R&D department to successfully innovate. The engineers are able to let their innovative drive accelerate, and help the company with new developments for their products and processes. Moreover a separate innovation function, distinctive from the customer order process, is visible within the use of a CtO modular system. This distinctive innovation function is the R&D department within a company. The R&D department will seek for the innovations, improvements and flaws within the production process and their products. This refers to the exploitative initiatives of the organization. Furthermore, it will constantly monitor the environment and the regional market of the organization. The environment is rapidly changing, therefore it is important as an organization to continuously change with it. Innovative ideas and mechanism may come from the external environment. This means that exploration within the company is required. Exploration is about seeking for radical and novel innovative solutions and products for the organization. Therefore, Belkadi, et al (2016) is arguing that, to enable innovations within a CtO modular system a feedback mechanism is required to collect customer needs that do not match the proposed modules. With the collected feedback, engineers can get to work for the creation of novel innovations.

So, a CtO modular system does have innovative abilities to improve their products and processes. Innovations are executed by a separate innovation function that is distinctive from the order process. Namely, the R&D department. Furthermore, the internal/external environment are constantly monitored and examined to execute an ambidexterity balance in their innovation project/portfolio.

2.6 Design theories

In order to understand the design principles for an innovation structure, it is important to universally discuss the essential design theories as an introduction to the L-STSD and MIOS. The examination of an organizational structure can be done from different perspectives. It is useful to review some of the different kinds of literature theories.

The theory of Mintzberg (1980), is a theory that particularly discusses how organizations structure themselves, in order to bring a division of labour into a number of tasks to reach the organizational mission or goals. His configurational approach can be considered as functional and visual. The theory emphasizes the idea that not every organization is the same. Therefore, the benefit of a visual conceptualization of the organization structure should result in a perfect internal and external fit. Due to the organization ability to shape their structure in a particular way. Nevertheless, this approach might be too focused on the standardization of the organization because of the idea of grouping a structure into a configuration. This weakness might result in less creativity, uniqueness, or responsiveness of the organization. Mintzberg (1980) introduces the eight parameters to measure the structure effectiveness of an organization. These parameters should structure the organization in a way that it effectively divides the divisions into 'basic parts' that satisfy the configuration. Nevertheless, this theory is lacking information about the structure of innovation. Therefore, it is less useful for the measuring of an innovation structure.

Furthermore, the theory of Thompson (2007) has their core ideas in understanding (modelling) organizational action (system/ org. level) and design it in a way that it can best manoeuvre in its environment, while at the same time keep the technical core "predictable". This theory is examining the level of predictability and adaptability of an organization. Also, Thompson (2007) argues, that organizations are open systems that under conditions of rationality strive for closedness. The organizational action will depend on different types of primary processes and diverse types of environments. Nonetheless, there are no clear directions regarding design parameters. Therefore, propositions have been used by Thompson (2007), to direct the design process. As a result, this theory cannot be considered as a protentional theory in measuring the innovation structure.

Achterbergh and Vriens (2019) model on designing episodic interventions is related to L-STSD of De Sitter (1994), and therefore considered as essential for the structure of innovation. The idea is that the organizational structure is formed in a way, in relation to the flow of orders, activities are grouped and coupled into a network of tasks. As a result, the number of disturbances between departments (teams) will decrease and the regulatory capacity

of departments (teams) will increase. For diagnosing an organization, this theory is using the 'quality of organization' in which it elaborated on the potential for innovation and the 'quality of work'. Furthermore, it applied the eight parameters of De Sitter (1994). For the design phase, the different levels of the organization is included. Namely; micro, meso, macro and the comprehensive thoughts of parallelisation or segmentation in an organization by De Sitter (1994). Generally speaking the primary goal of an organization, not only in the manufacturing industry, is to maintain viable. According to Achterbergh and Vriens (2011, p. 428), ''a viable organization is one that is able to maintain a separate existence''. This can be achieved by realizing the companies goals and adapting the companies goals to the changing environment. The realization of its goals, the organization is in need of the primary activities, the coordination and a control system for the determination of the organizations identity. To adapt the organizational goals, for the definition of the organizational identity, an intelligence, control and policy system is needed (Achterbergh & Vriens, 2011). These, in total five systems, might be considered as required for a viable organization.

2.7 Lowlands Sociotechnical System Design (L-STSD)

Sociotechnical design theories has developed differently on different continents the last half century. Eijnatten (1991, p. 6) argued, ''STSD is an applied science which is aimed at improving the functioning of both man and organization through adaptation or fundamental redesign of contents and organization of technology and human tasks''. From the seventies the Lowlands variant of STSD, developed by De Sitter, became more and more broadened. The L-STSD approach became the fundament of today's analyse and design principles for organizations. Moreover, it is an integral business approach for (re)structuring (social and technological) innovation of organizations.

Restructuring takes the distinguishment of two relevant sub-structures in the L-STSD:

- ➔ *Production structure:* ''the architecture of grouping and linking of executive functions into tasks and their relation to order flows'' (Lekkerkerk, 2012, p. 57);
- ➔ *Control structure:* ''the architecture of grouping and linking of control loops into tasks and their relation to the production structure'' (Lekkerkerk, 2012, p. 57)

These two sub-structures combined is the organizational structure. Meaning that designing an adequate organizational structure revers to ''designing the production structure relative to orders and the control structure to the production structure'' (Achterbergh & Vriens, 2009, p. 223). Within the organizational structure a distinction is made into four basic activities. These

activities does have a particular focus on the goals and interactions of an organization. Following are the basic activities explained (Achterbergh & Vriens, 2019):

- ➔ *Strategic regulation:* formulating long-term (new)goals, measuring if they have been achieved, adjust if necessary and determine what resources are needed.
- ➔ *Regulation by design:* makes sure that organizational conditions are installed, so that all activities can be performed. HR, technology and structure are important.
- ➔ *Operational regulation:* Realizing the formulated goals, deals with the disturbances within the primary process.
- ➔ *Performing primary process*: Realizing the formulated goals. Deals with the production and services of the organization.

An organization is a social system which has the particular purpose of creating a meaningful/organizational survival. Particularly, (re)formulating goals and trying to realize these goals in an adequate way to serve the overall organizational purpose. As a result, the organization will generate a contribution to their environment. This can be achieved by considering the relevant internal and external organizational variables. De Sitter (1994) named the variables as 'functional requirements'. It is important to start by defining the strategic requirements that the organization as a whole must comply to, in view of the market and the environment. Therefore, De Sitter (1994) argued the use of the external functional requirements which can be translated into internal requirements. see figure 5 for the illustration of the functional requirements and their translation:

- ➔ *Quality of the organization:* the organization's ability to meet market requirements and goals. Moreover, to comply to three types of requirements; order flexibility, control over order realization and potential for innovation.
- ➔ *Quality of work:* the organizations ability to meet employee involvement. Therefore, low levels of absenteeism and low levels of personnel turnover must be taken into account.
- ➔ *Quality of working relations:* the organizations ability to meet the productive cooperative cooperation between internal and external parties. Therefore, Effective communication must be considered.

These external requirements will be satisfied when the internal requirements have been met.

External functional requirements		Internal functional requirements
Quality of organization	order flexibility	Short production-cycle time Sufficient product variations Variable mix of products
	control over order realization	Reliable production and production time Effective control of quality
	potential for innovation	Strategic product development Short innovation time
Quality of work	low levels of absenteeism	Controllable stress-conditions;
	low levels of personnel turnover	Opportunities to (1) be involved, (2) learn, and (3) develop
Quality of working relations	Effective communication	Shared responsibility participation in communication

Figure 5: External functional and internal requirements (Achterbergh & Vriens, 2019)

For the integral (re)design of the organizational structure, De Sitter (1994) explained the importance of eight parameters. According to De Sitter et al. (1997, p. 507), ‘‘A designer should know how parameters are related to organizational deficiencies, and which parameters are in fact involved in various design questions and why’’. The organizational structure can be considered as good when the parameters are scoring low. To be more specific, the probability of disturbances are low and the regulatory potential is high. So, when scoring high on the parameters, the organizational structure can be seen as a bad structure. The eight parameters are divided into the production structure and the control structure. The first three parameters are related to the production structure. Whereas the other three parameters are related to the control structure. The last parameters are defining the relationship between the product and control structure. The parameters and their elaboration can be seen in Table 1.

Parameter	Brief description
Production structure	
1. *Degree of functional concentration*	Degree to which operational tasks are related to all (external/internal) orders
2. *Degree of differentiation of operational tasks*	Degree to which production, preparation and support activities are assigned to different tasks
3. *Degree of specialization of operational tasks*	Degree to which operational activities are split up into tasks covering only small part of the operational process
Control structure	
4. *Degree of differentiation of regulatory tasks into parts*	Degree to which regulatory activities ‘monitoring’ ‘assessing’ and ‘intervening’ are assigned to different task
5. *Degree of differentiation of regulatory tasks into aspects*	Degree to which ‘strategic regulation’, ‘regulation by design’ and ‘operational regulation’ are assigned to different tasks
6. *Degree of specialization of regulatory activities*	Degree to which regulatory activities have only small regulatory scope (i.e. cover only a small part of the operational process, or only a small set of other regulatory tasks
Production and control structure	
7. *Degree of separation regulatory and operational activities*	Degree to which regulatory and operational activities are assigned to different tasks
8. *Degree of separation per control function*	Degree to regulate or control can be depicted as a control cycle with different steps (observing, assessing and intervene).

Table 1: description of the eight parameters by De Sitter (1994)

Now that the functional requirements and parameters have been defined. The (re)design of the organizational structure can start. Which will begin at the macro level (creating stream-wise departments) of the production structure, to the micro level (creating teams). This process is dominated by the principles of parallelization, segmentation and creating teams. Secondly,

(re)structuring, of the control structure, should proceed from the micro level towards the macro level. This process of restructuring the regulatory potential is defined as; what kind of regulatory potential can be arranged within and between the teams, the regulatory potential between the different segments, and the regulatory potential between the four basic activities. Based on literature of cybernetics by Ashby (1956), it can be said that the four basic activities are supported by the structure if; the structure is not a source of disturbances and it comprises the mans to deal with the disturbances. The structure should generate regulatory potential.

2.8 The Model Innovation and Organization Structure (MIOS)

As explained before, MIOS is an addition to the L-STSD approach. When using the MIOS, you can very systematically diagnose any structure of innovation in an organization. According to Lekkerkerk (2012), MIOS is a model that is connected to the basic activity of 'regulation by design'. Therefore, an integral approach for structuring innovation requires linking the control structure and innovation to the production structure. As a result, the model will comprise innovation details of the production structure.

In the literature, no other innovation design structure model is discussed that is suitable for this study. Beer's (2000) functional Viable System model (VSM) might be considered as useful. Like De Sitter (1994), he incorporated the logic that builds on the idea of STSD. Nevertheless, his approach only includes five functions of which only two of them are focused on innovation. Moreover, MIOS is the most effective model to research an innovation structure within an organization. The main focus of MIOS is to exhibit the structural functions concerning exploitation and exploration of innovations. In figure 6 the MIOS is visible.

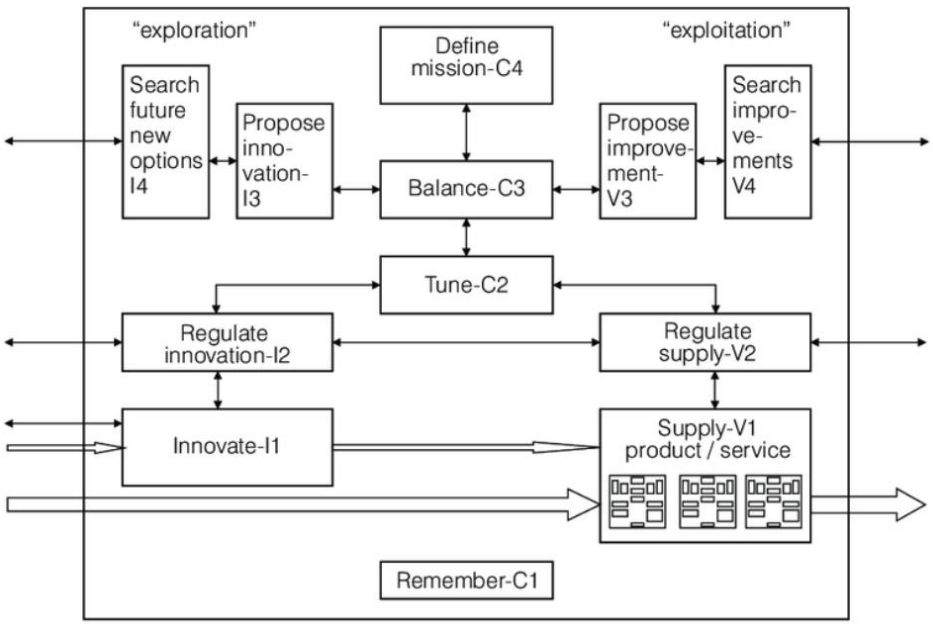

Figure 6: The developed functional MIOS (Lekkerkerk, 2012, p. 296)

In the MIOS twelve functions are included in de model, what later became thirteen functions. The thirteenth function is considered as part of the operational control loop. This continuous improvement function is introduced by Lekkerkerk at STS-RT-conference in Louvain, Belgium (2015), and is mainly carried out by any department with not a lot of involvement of other departments. According to Lekkerkerk (2015)‘‘continuous improvements has to be deliberately organised and managed according to Total Quality Management and lean theory, and its importance for the overall performance improvement, means that one should pay explicit attention to it when diagnosing a structure’’ (Lekkerkerk, 2015, p. 8). The thirteen functions are related to the STSD literature and innovation management. Their explanations can be seen in table 2. The functions fall into three categories. Namely; V-function, I-function and C-function Within these categories, their functions are ordered from one to four.

- ➔ *V-function (Preparatory):* which is referring to the primary production process. This is situated in the exploitation phase.
- ➔ *I-function (Innovation):* which is referring to the innovation abilities. This is situated in the exploration phase.
- ➔ *C-function (Central):* which is referring to connecting both exploitation and exploration. This is called ambidexterity for the balance in the innovation project/portfolio.

Name of Function	Code	Explanation
Supply product service	V1	Represents the primary process supplying products and/or services by transforming inputs in output. Includes order-related activities: logistics, process planning, sales, finance, procurement, etc. Includes supporting activities: maintenance, HR, facilities management etc.
Regulate supply	V2	Operational regulation of the various aspects of the primary process including continuous improvement
Propose improvement	V3	Make project proposals for the best opportunities for improvement received from V4
Search improvement	V4	Search for and find ways to improve exploitation of current products, markets, facilities, etc.
Innovation	I1	Carry out all approved innovation projects and improvement projects
Regulate innovation	I2	Operational regulation of individual innovation projects and operationally manage the portfolio of projects in progress
Propose innovation	I3	Make project proposals for the best future options for innovation received from I4
Search future new options	I4	Exploration of environment and search for future options for innovation, aimed at new and existing markets
Remember	C1	Organizational memory storing codified knowledge relevant for the organization
Tune	C2	Tuning V1 and I1 enabling smooth implementation of innovations and tuning the upper six functions contributing to the strategic planning process
Balance	C3	Balancing the project portfolio by strategically choosing which new proposals (from V3 & I3) should be funded and at the same time which of the projects in progress should be continued, paused or aborted
Define mission	C4	Define the mission, vision and strategy for the company and deriving lower level strategies for supply and innovation including performance indicators and budgets
Continuous improvement		Small scale improvement or ‘kaizen’ activities within each functions operational regulation

Table 2: Overview of the functions with names and codes (Lekkerkerk, 2012, p. 297)

All the thirteen functions are interrelated with each other and with the environment of the organization. As a consequence, the functions are relevant when the mutual coherence make their contributions. Hence, when implementing all the functions and their relations into the organizational structure, including assigning the employees to the different functions, the organization should be able to stay viable (Lekkerkerk, 2012). Therefore, it must be taken into account that the assigned employees should be well-trained and competent for the different functions. As a result, the social part comes into play. The parameters and/or the functional requirements of L-STSD are well established design principles to diagnose the social aspects.

2.9 Conceptual model

Resulting from the literature, Figure 7 presents the conceptual model of the important variables for this study. The organizational innovation structure and their projects are differently based on the different modular system. So, to research the possible changes in an innovation structure, a diagnosis of the different modular systems will be performed. Therefore, This research considered organizational innovation structure as the independent variable. This independent variable is going to be diagnosed with the help of L-STSD and MIOS. Innovative ability is considered as the dependent variable. This variable includes the generation of ambidexterity, creativity and renewal within the manufacturers product, services, technology, work processes or markets (De Jong , Kemp, & Snel, 2001). Moreover, there is a direct relation between the organizational innovation structure and the innovative ability of a manufacturer, because a different production process might lead to an improved or deteriorated ability to innovate. It will reveal the innovative abilities of the EtO and CtO organizational and innovation structures

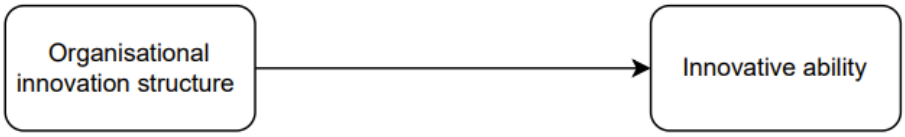

Figure 7: conceptual model

| Chapter 3: Methodology

In this chapter an outline is given on how the research process was performed in order to draw conclusions and recommendations. Moreover, research methods, data collection, case description, operationalization and the intended data analysis procedure are being discussed. Additionally, limitations and ethical considerations of this study are explained for the clarification of the quality of this research.

3.1 Research design

In the second chapter, a theoretical framework is produced. In this framework, relevant literature related to the subject of organizational innovation are discussed. Also, it introduces the design theories that are used for the empirical process of this research.

For this study, qualitative research methods are used to understand the changes in an organizational- innovation- structure when switching to a CtO modular system. This type of research will give in-depth knowledge and assumptions of the relevant concepts (Vennix, 2019). In addition, the research process is of a deductive nature. Meaning that inferences can be drawn from existing theories and models to diagnose and understand the innovation structure at Movexx International. Therefore, the models of L-STSD and MIOS are included as the base of diagnosing the organizational and innovation structure. Both of these models are important for this research because the primary process is connected to the structure of innovation (Lekkerkerk, 2012). Especially, in the EtO modular system approach where innovation is intertwined within the order/assemble process.

To collect data, the single case study design principles are applicable. Due to this, Movexx International is considered as the unit of analysis and the focus is to detect explanations for the operationalized concepts. Diverse types of empirical evidence can be used within the principles of a case study. Hence, interviews and documents are used to find out how the organizational- innovation- processes run at CtO/EtO and what their structure is. These multiple sources of data are collected and interlinked for the formulation of conclusions and recommendations. In this process, of collecting data, the researcher is actively involved and will take a neutral position for the generation of objective results.

Furthermore, this study is providing conclusions and recommendations for the innovation structure of Movexx International. It does have a theoretical contribution but at the same time it is practice oriented. Moreover, it is linked to the five phases intervention cycle by Verschuren (2009). The five phases are: problem analysis, diagnose, design, intervention, and

evaluation. Nevertheless, it will only use the first two phases because there will be no design, intervention or evaluation. The formed recommendations for Movexx International are not implemented nor assessed. The results are based on the research of the problem analysis and diagnose of the organizational and innovation structure at Movexx International .

3.2 Data collection

For the understanding of an EtO and a CtO modular system in relation to an organizational-innovation- structure, a single case study is selected. This resulted in the collection of data via literature, interviews and documents, for the diagnose at Movexx International.

First, literature is reviewed for the creation of the theoretical framework in chapter 2. Because of that, it is possible to answer the theoretical sub-question created in section 1.1. However, information collected at a later stage in the research process, which might have to be reviewed, will influence the creation of recommendations, conclusions and discussions. Moreover, completing the theoretical framework does not mean the stop of enquiring important literature.

Secondly, documents are selected from Movexx International that does have a contribution to this research (see appendix 1). For example, annual reports, innovation policy plans, production process documents, company newspaper or magazines. The use of the different documents and their mutual coherence provides an overall picture of the organizational- innovation- structure and their innovative ability at Movexx International. As a result, with the information of documents from Movexx International, it is possible to diagnose their structure of organization and innovation by using L-STSD and MIOS.

Thirdly, semi-structured interviews are used to explore, in-depth, the relation and changes in the organizational innovation structure. The questions are pre-made, open and presented in an interview guide (see appendix 2 for a general overview of the interview guide created by Lekkerkerk (2012)). The questions are formulated with the help of the operationalized variables, which are of importance in this research. Section 3.4 discusses the operationalization of the variables. The use of semi-structured interviews allows the interviewee to formulate and respond in their own words. The interviewer is able to steer the interview, while at the same time allowing discussions to happen. As a result, it is possible to get a variety of opinions, arguments and information for this research. Respondents are being asked for their permission to record, transcribe and code the interview. The selection of respondents vary within the company. What they have in common is that the selected interviewees are all

involved in the innovation or order process at Movexx International. In table 3 an overview is given of the selected interviewees and their departments.

Name (anonymise)	*Gender*	*Position*	*Time of employment*	*Date of interview*
Respondent 1	Female	Product engineer	4 year	04-05-22
Respondent 2	Male	Sales engineer	15 year	09-05-22
Respondent 3	Male	Head of engineer	5 months	09-05-22
Respondent 4	Male	Order preparator	9 months	10-05-22
Respondent 5	Male	Sales director	2,5 year	11-05-22
Respondent 6	Male	Product engineer	1,5 year	16-05-22
Respondent 7	Male	Purchaser	2,5 year	18-05-22
Respondent 8	Male	Head of operations	4 year	25-05-22
Respondent 9	Female	CEO	6 year	08-06-22

Table 3: Selection of respondents at Movexx International

3.3 Case description

For this research, Movexx International B.V. is the unit of analysis. Movexx International is a Dutch manufacturer and developer of electric towing aids. Their headquarters and assembling is located in Veenendaal (The Netherlands) and does employ 47 employees. The company is B2B oriented and sells its products through a worldwide network of dealers within several market segments. For example, airport, food & Pharma, retail & distribution etc. Movexx International is established in 2006 by Henk van Vlastuin. His motivation was to develop electric towing aids that takes away physical efforts of employees who had to transport heavy carts and trolleys, and to increase efficiency within a company. The companies first focus was on electric towing aids that had to be driven by employees themselves. However, from 2013, the company also started producing automated guided towing aids. These are vehicles that follow an optical route completely autonomously. Therefore, it can be said that Movexx International is a company that is leading, innovative, dedicated and authentic within its industry (Movexx, n. d.).

A view years ago Movexx International started to transform from an operating EtO business model towards a CtO business model. They have the vision to use a product configurator and work according to the CTO principles. Therefore, Elfsquad (A consultancy company in the field of production processes) was requested to help them. Today, their production and order process is designed as 75% CtO and 25% EtO. The electric towing aids are designed with a modular configuration system. But, the coupling hook (a hook that connects carts to the towing aid) is still most of the time customer specific engineered. As a result, the organizational- innovation- structure at Movexx International is dedicated to both CtO and EtO.

This research is specifically interested in the change of organizational- innovation-structure, when changing to a CtO modular system business model. Therefore, the case of Movexx International is an adequate case to be researched. At the moment, Movexx International does not have a concrete insight into their order process with the associated innovation structures. Therefore, this research will elaborate and visualize the organizational/innovation structures and the innovative abilities of Movexx International. As discussed in section 3.2, interviews will be conducted. These interviews are executed with employees of departments that are relevant for this study. Moreover, the interviewed employees of Movexx International can be considered as the unit of observation.

3.4 Operationalization

For the development of the interview guide, diagnose and a better understanding of the variables, the concepts emergent from the theoretical framework are operationalized in this section. According to Vennix (2019), operationalization is the way in which abstract concepts are made measurable. Therefore, see appendix 3 for the graphical representation of the operationalization. Concepts, dimensions and indicators are presented.

The concept of innovative ability can be divided into two dimensions; ambidexterity and innovation type/level. These dimensions can be measured by their indicators. For ambidexterity, the degree of exploitation and exploration are being measured. For the innovation type/level of an organization, Bilton and Cummings (2010) 'creativity' and 'renewal' are used as the indicators.

Secondly, the design models of De Sitter et al. (1997) and Lekkerkerk (2012) are the models that will be used in diagnosing the organizational EtO/CtO organizational- innovation-structure within Movexx International. As can be seen, the dimensions of L-STSD are the eight parameters and the dimensions of MIOS are the thirteen functions. The Explanations of the parameters and functions are given as the indicators. In broadened terms, an organizational structure can be considered innovative if it scores low on the design parameters and when it scores good on the functions.

3.5 Data analysis

After the data are collected via the use of documents and interviews, the data analysis process starts. In this process of transcribing, coding and finding patterns the indicators and dimensions are used that are visible in appendix 3.

The documents that have been studied are analysed and coded by using a coding process. Quotes and words were selected and transformed into open codes that are related to the earlier mentioned indicators. This eventually led to the identification of patterns. These patterns are considered as the dimensions who are explained in the operationalization. As a result, it is possible to diagnose the innovation and organizational structure of Movexx International because the functions of MIOS and the parameters of De Sitter (1994) are examined and considered as high or low. This process of giving values to the functions of MIOS and the parameters of L-STSD can be considered as less qualitative and which in turn evokes the small quantitative aspect of this research. The same coding process was applicable for the interviews. Nonetheless, the interviews are first transcribed before it was possible to code them. The interview with respondent 9 was short and planned at the very last moment. For this reason, a document with important notes have been made for this interview. The quotes and codes gained from the interviews are processed into a codebook. This codebook is an easy-to-read book where you are able to find the quotes that are connected to a specific code.

Using this data analysis technique, the inclusion of relevant information is based on the theoretical concepts gained from the theoretical framework. Nevertheless, it might be possible that different concepts emerge during the data collection. Attention will be paid to that.

3.6 Credibility and validity

To enhance the credibility and validity, comparing interviews, documents and literature is performed. It enriches the researched internal validity due to the variety of data being analysed and compared. Central to this is the notion of leading to the same results. This increases the generalizability (external validity) of the results. The interview and document analysis methods will be compared with the theoretical framework for the formulation of recommendations and results. Therefore, these conclusions can be generalized to the field of innovation and organizational structures within the manufacturing industry.

The dependability of this research is achieved by its trustworthiness. The operationalization of the concepts into dimensions and indicators are reliable and can be reproduced from the literature. Nevertheless, the interpretation of the researcher is still present. Meaning that the different quotes from the interviews and documents can be misinterpreted and wrongly classified to an incorrect indicator. Member check is the solution for this and is performed in this research.

3.7 Research ethics

Qualitative research is defined by its proximity to what is being studied (Symon & Cassell, 2012). The researcher is evaluating the significance of influencing, discussing and interpreting findings. Therefore, the ethical implications are being discussed to reveal the quality of this study. Research ethics is considered as the fundamental principle for research activities. These activities include the research design, implementation of the research, respects to the society and the use of resources & regulations.

For this research 'confirmability' is essential. According to Lincoln and Guba (1989), confirmability is the audit that clarifies where the data came from and how such data were transformed into findings. Therefore, the researcher took a neutral and objective position and was trying to do the right thing. Moreover, the objectivity of this research is explained by the means of its confirmability. The actions that have been taken for its confirmability are;

- ➔ Respondents are being treated as respectfully. Transparency was present in the process and respondents were informed about the objectives of this research. Before every interview a consensus form was filled in and the respondents were asked if the interview could be recorded.
- ➔ After transcribing the interviews, the transcripts have been member checked to ensure that misunderstandings and wrongly interpreted information is deleted. Furthermore, the respondents are only mentioned by their function and not by their name. Because of that the confidentially between interviewer and respondent is increased.

| Chapter 4: Analysis

This chapter will give a description of the results emerging from the interviews and documents. The organizational and innovation structure is diagnosed to see if the company will remain viable when changing towards a CtO business model and if this change influences the innovative ability at Movexx International. Therefore, a general explanation will first be given about the organizational structure and their order flow. To pass into the parameters of De Sitter (1994). Thereafter, the innovation structure of Movexx International is analysed with the help of the functions of MIOS. The results of the functions and parameters will also shed light on Movexx's innovative ability, which is described in section 4.4. For the elaboration of the comparison between the actual and desirable situation at Movexx International it is referred to see section 4.5. To finally continue into the general summary of the analysis

4.1 General characteristics

Movexx International is a manufacturer company that can be described as a decoupled-line structure. As it illustrates in the organogram (see figure 8), it is a structure in which the tasks are divided into related departments, above every employee is a manager. Similar activities are placed in separated departments where there is a specialization according to their function. Furthermore, different department managers are selected for the management team (MT). This MT is responsible for the company's policies, missions, vision, and targets. It is represented by the CEO, Business controller, Sales director, head of operations and the head of engineering.

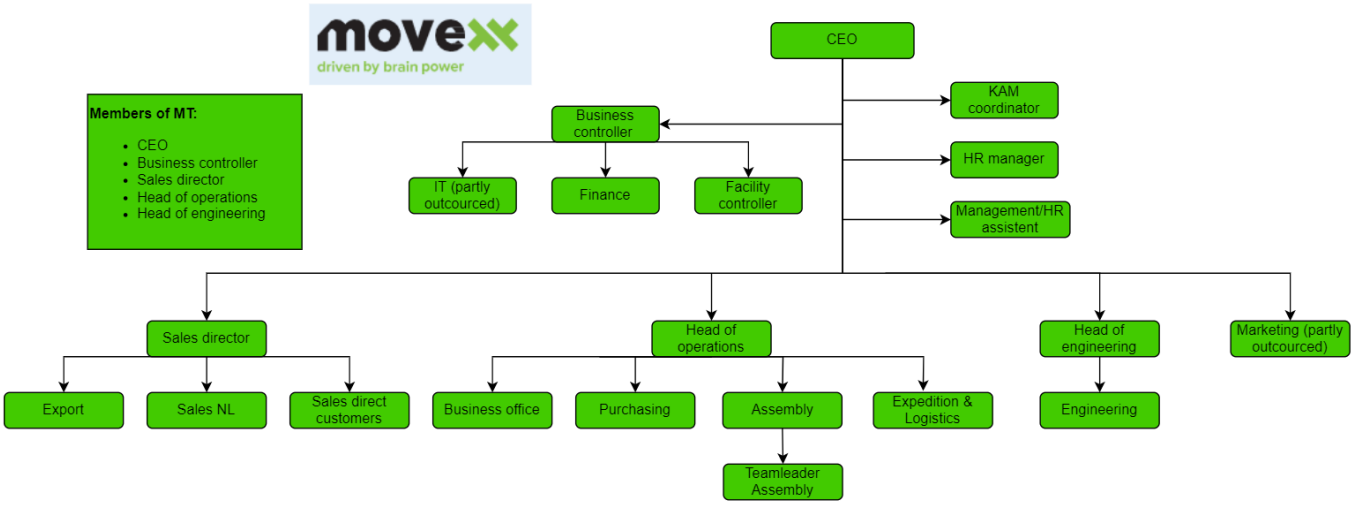

Figure 8: Organizational chart Movexx International

The organizational structure of Movexx International can be divided into two main flows. A configuring order (CtO) oriented flow and a customer specific (EtO) oriented flow. These are

flows that are formed to be the Macro organizational structure and can be categorized into the V1 function of supply product service of MIOS. Within each of the two flows some of the different departments have their own layout that in turn gives shape to the Meso and Micro organisational structure of Movexx International (see appendix 4 for the Meso and Micro organizational structure). Nevertheless, the employees within this production structure are not assigned to one of the flows. Movexx International is not big enough to be able to distribute employees properly between the two flows. Therefore, the difference is that within the customer specific flow, engineering is still needed to (generally) make customer specific hooks.

The product portfolio of Movexx International is illustrated in appendix 5. The electric towing aids are divided into categories. For example, tilting, pedestrian, or platform. Here it is visualized that the T1000 and T1500 are products that are made on a production line. They are the only two machines that are standardized to be assembled on a line. The rest of the products are not standardized. Moreover, According to Kuipers, Amelsvoort, & Kramer (2018) the products at Movexx International do differ from each other but have roughly the same processing sequence. We can speak of a fixed processing order, also known as a semi-homogeneous order flow.

4.2 Diagnose of the Organizational structure

The eight parameters of De Sitter (1994) are used for the diagnose of the organizational structure at Movexx International. As explained in chapter 2.7, the parameters that have a low value are seen as parameters with a low probability of being problematic. The parameters with a high value are seen as parameters with a high probability of being problematic. And the parameters with an average value are seen as parameters with a chance to be problematic. For the visualization of the primary process at Movexx International, it is preferred to see appendix 4. Furthermore, see table 4 for the preliminary conclusion of the parameter's values and their link to the external functional requirements. Furthermore, see appendix 6 for an extensive summary of the structural parameters.

Parameter 1: Functional concentration

The primary order process can be divided into a configuring order flow and a customer specific order flow, but they are not separated from each other. The orders all go through the same departments within the primary process. The difference is the application of the engineering department. At the customer specific orders, engineering comes in handy to design the customer specific hooks. As the comment of respondent 1 indicates ''all products that require a

specification will come through me'' (personal communication, 4 May 2022). It does not matter which product order it is, when it needs a customer specific hook the order will pass by respondent 1 at the engineering department. In addition, according to respondent 3 ''in the normal order flow you are actually not involved as engineering'' (personal communication, 9 May 2022). This means that the configuring order flow is a flow that does not include engineering. That is also confirmed by document 1 (Configurator_flow-full) and document 5 (sales process EtO_CtO_Elfsquad_all). It shows that the order process is a continuous trajectory within the configurational flow. However, if an engineering request is required (such as a hook or an option that is not possible) then the order might take longer to be delivered because of the extra engineering time.

Furthermore, Respondent 2 explained ''So those are actually the two streams that you can distinguish within sales; the dealer order abroad and sales direct Netherlands'' (personal communication, 9 May 2022). Due to this, the sales department can be divided into dealers' orders abroad and dealers & direct sales Netherlands as can be seen in appendix 4. Up to the assembling department, every order goes through all departments. The interviewed respondent 4 indicated that the planner, purchase, stock, order picking and pre-assembly departments are seeing all the product orders. Moreover, every product order will go over the same process. This does not happen in the assembly department. Because Movexx International is moving towards a CtO structure, that includes more standardization. it does have a line production method that is used for the assembly of the T1000 and the T1500. Respondent 4 explained that ''We have a production line in production and that's where we actually do the T1000 and the T1500 machines'' (personal communication, 10 May 2022). Therefore, it can be considered as two flows within the assembly department. The line production flow and the flow with the rest of the products. This line production flow can be considered as important because the T1000 and T1500 are the running products. According to respondent 8 ''yes those are the runners of the company. So, the T1000 and the T1500'' (personal communication, 25 May 2022).

To conclude, all the products of Movexx International are going through every department. A product will need engineering expertise only if it needs a customer specific hook, or an option that is not possible to make. Nonetheless, the sales and assembly departments are somehow distinguished into flows. As a result, The primary order process of Movexx International is given an average on being problematic for the parameter of functional concentration.

Parameter 2: differentiation of operational tasks

Within the order process the differentiation of production, preparation and support are visible. The three tasks are distinguished between different departments. Therefore, it does have an indication that the differentiation might be problematic. Nevertheless, this is because of the small number of employees within the primary process. Respondent 2 (member of the sales department) argued ‘‘Preparatory is when we see a market in the future, we have a market in mind where we can add value and that is what I call preparatory’’ (personal communication, 9 May 2022). Sales can be considered as preparatory, but this preparatory work does not only include selling and processing the orders. His arguments indicates that sales is also a starting point of for example a new innovation. The planning, purchase and order picking can also be considered as preparatory work. According to respondent 4, ‘‘Preparatory is by far the number one’’ (personal communication, 10 May 2022). This was also emphasised by respondent 7 ‘‘Preparing. But I do make my own schedules and I think along about how the purchasing department should function’’ (personal communication, 18 May 2022). The assembling department can be classified as the production. The production tasks are the pre-assembly and the assembly of products. Respondent 8 explained ‘‘Assembly of course 100% make/create. And in my case, yes, support as well. But I also have the preparatory’’ (personal communication, 25 May 2022). The manager of operations classified himself in all three tasks, whereas the assembly department is only classified in the task of production.

Finally, the engineering department can be considered as a supporting department within the primary process (only when a customer specific order is needed). However, the members of the engineering department explained that they also do preparatory and production tasks. Respondent 3 cites ‘‘So we are just making and creating and then we support a bit’’. Respondent 6 also confirms this ‘‘Defining a product, preparing it and making sure everything is in the system. Is simply preparing the production.’’ (personal communication, 16 May 2022).

To conclude, due to the differentiation of operational tasks between different department, it can be considered as a high parameter value. Nonetheless, this is because Movexx International has a small number of employees working in the primary process. Also, some departments feel that they do more than just one task.

Parameter 3: specialization of operational tasks

The operational tasks within each department, which are related to the order process, does have some specialization. However, for the departments of planning and purchase the specialization is low, due to the small number of members working in these departments. Also, respondent 4

explained that ‘‘Some orders from foreign dealers’ land on my plate. So that sales actually just skips’’ (personal communication, 10 May 2022). Moreover, extra tasks are sometimes added. Within sales, the operational tasks are seemed to be specialized only into geographical order. The segments in which Movexx International are active are not specialized to different employees. According to respondent 5 ‘‘We have sales export managers and sales managers for dealers. Within that, we have seven segments. But we don't have one person, for example, working full time at Airport’’ (personal communication, 11 May 2022). Within engineering the specialization of tasks is visible. There is one engineer member who is doing the customer specific orders. Whereas the rest is working on machine development. Respondent 6 cited ‘‘I think that respondent 1 is actually one of the only ones who works in a customer-specific way. The rest just work on the machine generation’’ (personal communication, 16 May 2022).

Finally, the assembly department does specialize the operational flows. Nevertheless, within the two flows (line production and the rest of the products) the employees are responsible for all the tasks. There is not a high degree of divided tasks within the two flows. According to respondent 8 ‘‘There are 3 working in the line and 6 working outside the line. Yes and those three in the line are also running the line’’ (personal communication, 25 May 2022).

To conclude, within the engineering department the specialization of tasks is visible. Whereas, for the departments within the primary order process the specialization is less present. This indicates that the degree of specialization of operational tasks can be considered as an average value of being problematic.

Parameter 4: differentiation of regulatory tasks into parts

Generally, the regulatory activities of monitoring, assessing, and intervening are assigned to the different departments. Every department has their own monitor assessment and intervening principles. All the interviewed respondents felt somehow an affinity with the regulatory tasks. For example, respondent 6 who explained ‘‘You also have a role in the process of assessing and monitoring, in any case providing documents, so that they can assess’’ (personal communication 16 May 2022). Furthermore, respondent 4 argued ‘‘I have to do all three, yes. I must continue to assess my own process. A bit of a supervisory role and I actually organise my own planning, my own tasks’’ (personal communication, 10 May 2022). This indicates that the employees do have regulatory potential within their own tasks. However, the members of different departments are still monitored, assessed, and intervened by their managers. According to respondent 3 ‘‘Yes, in Movexx you always wear that hat as a manager at some point’’ (personal communication, 9 May 2022).

To conclude, employees of the different departments within the primary process at Movexx International can monitor, assess, and intervene their own activities. Nevertheless, the uprising problems or issues are still reported to the manager or team leader. But, most of the time employees can solve the problem by themselves. Therefore, the parameter of differentiation of regulatory tasks into parts can be valued as low.

Parameter 5: differentiation of regulatory tasks into aspects

The department managers of sales, operations, and engineering together with the CEO and the business controller are members of the management team (MT). This team is responsible for the strategic and design regulations within Movexx International. To be specific, it will formulate the missions, visions, and yearly targets. Respondent 3 explained ‘‘I delegate most of the time and I am therefore only in the role of critic. Yes, and the formation of the strategy is also something that I am involved in’’ (personal communication, 9 May 2022). Respondent 5 also confirmed this ‘‘The people in the management team or the project leader will make the decisions’’ (personal communication, 11 May 2022).

On the operational level departments are responsible to achieve their own quarterly targets. Every department has the freedom, within some boundaries, to make three quarterly targets. Hence, it is expected that they will be achieved. Respondent 7 cited ‘‘make three quarterly targets and make sure you achieve them, that can be seen as bottom up’’ (personal communication, 18 May 2022).

To conclude, strategic and design regulations are executed by the MT of Movexx International. The operational regulation are somehow bottom up, due to the creation of quarterly targets. Thus, the control functions at Movexx International are differentiated into the separated regulation levels. As a result, this parameter does have a high value.

Parameter 6: specialization of regulatory activities

Objectives are generated in the MT. These objectives are then followed up by the department managers who, in turn, communicate them to the employees. This assumes that the structure of Movexx International is a hierarchical structure. Nevertheless, respondent 1 argued that ‘‘I can act reasonably autonomously’’ (personal communication, 4 May 2022). Members of different departments feel that they can work autonomously. This might be because of the quarterly targets that departments can create by themselves. However, Movexx International is a small/medium sized company. Because of this, employees do feel freely and autonomously when doing their work. As a result, this parameter of specialization of regulatory activities does have a low value.

Parameter 7: Separation of regulatory and operational activities

The separation between operational and regulatory activities is not yet applicable at Movexx International. At the moment the company is not that big, the managers in the MT are looking after the strategic interests but also the operational interests. Moreover, the MT and the managers determine the strategic direction and are then also responsible for the primary process. The employees of the different departments indicates that they can have a say in the objectives but not so much in the strategic direction of the company. Nevertheless, if they have an idea about the strategic regulation. They are free to be discussed. As a result, this parameter of separation regulatory and operational activities is considered as average.

Parameter 8: separation per control function

The control functions of observing, criticizing, and intervening are considerable functions that are woven into the processes and employees of Movexx International. Respondent 4 explained ‘‘just by being the spider in the web and actually shortening those lines by quick reaction’’ (personal communication, 10 May 2022). This illustrated that the employees are feeling responsible for the observing, criticizing and intervening control function. Of course, formally the managers are often the last step in the process. but informally there is no separation in the control circle at Movexx. Employees can observe and criticize their own work. To conclude, this parameter does have an average value. But it is close to a low parameter value.

Parameters	Value High/average/low	External functional requirement
Production structure		
1. Degree of functional concentration	Average	Quality of organization
2. Degree of differentiation of operational tasks	High	Quality of organization
3. Degree of specialization of operational tasks	Average	Quality of organization and work
Control structure		
4. Degree of differentiation of regulatory tasks into parts	low	Quality of work and working relations
5. Degree of differentiation of regulatory tasks into aspects	high	Quality of work and working relations
6. Degree of specialization of regulatory activities	low	Quality of work and working relations
Production and control structure		
7. Degree of separation regulatory and operational activities	Average	Quality of work
8. Degree of separation per control function	Average	Quality of work

Table 4: organizational structure parameter values and their functional requirement

4.3 Diagnose of the Innovation structure

For the analysis of the innovation structure at Movexx International, MIOS is used. This will give a representation of the innovation efforts related to the organizational structure within the organization. The thirteen functions are given a score of being formal or informally present, and what their degree of functioning is; good, sufficient, reasonable, or insufficient. Please, see table 2 for the explanation of the different functions. Furthermore, see appendix 7 for the comprehensive analysis of the thirteen functions and table 5 for the preliminary conclusion.

V1-Supply product service

This function is accommodated within the primary process. As it was already explained in section 4.2, the primary production process can be divided into the configurational and customer specific order flow. Because of the shift towards a CtO structural design, the customer-specific orders will decrease in the future. Respondent 1 indicates that ‘‘Because of Elfsquad (a CtO program), more and more will be targeted at CtO’’ (personal communication, 4 May 2022). This shift could benefit the delivery time of orders. According to respondent 2 ‘‘If you really want to have something customer-specific, we have to book engineering time. In the past we could always do that in parallel, but we are too busy for that now’’ (personal communication, 9 May 2022). The delivery time of a configurational order on the line production is approximately 5 to 6 weeks. In addition, Respondent 8 explained ‘‘Late deliveries were customer specific deliveries’’ (personal communication, 25 May 2022). This slows down the primary process. So, the desired shift towards modularity of products is beneficial for the future innovation outputs, as it was noted by respondent 7 ‘‘So basically you already have all your thinking in that program, so you don't have to spend time on that anymore, because everything in it is correct and then you can focus on the innovative and customer-specific parts’’ (personal communication, 18 May 2022). Furthermore, there is also the feeling that the order process is somehow an issue of handling. Respondent 3 cited ‘‘Primary process of Movexx are mainly involved in the issue of handling’’ (personal communication, 9 May 2022). As a result, the order will go back and forth between different departments. However, the primary process with the preparatory tasks and support tasks are formally illustrated in document 5 (Sales process EtO_CtO_Elfsquad_all). It is a document with an overview of the different steps between the customer and the delivery of the order.

To conclude, the V1 function within Movexx International is formally present. There are structures illustrated and employees know these pathways. However, the primary process is shifting towards a CtO oriented structure. At the moment, the process is approximately issue based due to the customer specific orders. Therefore, it is functioning reasonable.

V2-Regulate supply

The MT is responsible for the strategic and design regulations. Whereas the managers of the different departments are responsible for the operational regulation. Movexx International does not have a lot of employees. Therefore, the connections between employees and managers are short. These managers of the departments are also a member of the MT, which is beneficial for the regulatory potential of employees. Respondent 8 argued ‘‘We are not imposing everything from above’’ (personal communication, 25 May 2022). Employees can make autonomously decisions and might increase the innovations within the primary process of Movexx International. Nonetheless, the communication between sales and the engineering department might cause problems within the customer specific order flow. According to respondent 1 ‘‘Supply of sales could be better, so that no feedback is needed every time’’ (personal communication, 4 May 2022). To be more specific, the supply of guidelines should be improved by the sales department. Respondent 2 explained ‘‘Cross-pollination in innovation is so incredibly important. That is also a piece of knowledge/certain insight and you can't just capture that, but it has to be translated to the customer’’ (personal communication, 9 May 2022). As a salesperson, it is important to have the knowledge and insights to create the customer specific guidelines.

To conclude, this function of regulation the supply orders is formally structured. There is a MT group with managers of different department who are regulatory responsible for the supply within Movexx International. However, employees can work autonomously and regulate their own supply. Besides that, the internal regulation between sales and engineering could be improved. As a result, this function is given an average.

V3-Propose improvement

In a joint consultation in the MT different proposals for improvements are discussed. This group is called the product review group (PRG). In document 4 (Change process_V1), the process is formally visible. The PRG will review all submitted Non-Conformity-Reports (NCR) and Change Requests (CR) and will assess the impact and urgency. These NCR’s (Faults, Quality/security issues or deviation) and CR (improvements, stock/purchase issues etc.) can be commissioned by everybody in the organization. Nonetheless, respondent 5 cited ‘‘We are in the process of implementing shop floor where they can report comments regarding work instructions, etc. At the moment that is still happening with a piece of paper (personal communication, 11 May 2022). So, the digitalization of this process does still need to happen. Furthermore, respondent 2 explained ‘‘So, I get remarks from the direct customers. Then I need

an engineer who will shape that. And then you go into a trajectory'' (personal communication, 9 May 2022). This does give the indication that a lot of the proposed improvements will start at the sales department because they are in connection with the customer. However, this can be considered as product improvements.

To conclude, a formal structure for proposing improvement is present. But, it has not been implemented digitally yet. Now the employees are still using a piece of paper. Therefore, this function is formulated as informal. The indication is that most of the proposed improvement are coming from the Sales department. Nevertheless, everybody can propose new and better improvements. As a result, this function does have a sufficient value.

V4-Search Improvement

Searching for opportunities to improve the existing products and knowledge for a better exploitation does originate most of the time from the customers. Respondent 1 noted ''Impulsive sometimes the best solution, but mostly it will come from the customer'' (personal communication, 4 May 2022). Due to this, sales performs this function continuously. According to respondent 2 ''I tell you what happens in the market. I am the eyes of the company and that is what you communicate, we communicate that every Monday'' (personal communication, 9 May 2022). So, every Monday the sales team does have a small meeting to communicate the possible improvements. Nonetheless, respondent 6 explained ''We sometimes miss some input from the user side'' (personal communication, 16 May 2022). This does relate to the communication flaws between sales and engineering that should be improved.

To conclude, the function of search for improvements is mostly executed by the sales department. These improvements are coming from the customers into the company and their processes. To communicate the possible improvements, they can fill in a NCR or CR (document 4, Change process_V1). Everybody in the organization can submit these NCR's or CR's and the MT will have a look into it. However, the sales department is most of the time the executive actor in this process. As a result, this function is formally present and is functioning good.

I1-Innovation

Innovations within Movexx International are mostly carried out on a project base. These are the long-term radical projects for new products. Respondent 6 explained ''Respondent one does the customer-specific projects, I just really do more long-term projects (personal communication, 16 May 2022). It does imply that, within the engineering department, one employee is responsible for the customer specific orders. And, the other members are responsible for the long-term radical product innovations. The execution of the innovation

projects within Movexx International is not clear. According to respondent 5 ‘‘When an engineer says; I have an update for a machine or if I see possibilities with that machine, that can also be the start of an innovation’’ (Personal communication, 11 May 2022). These interview quotes show that radical product innovation projects are generally performed by the engineering department. However, formally selected groups of people who are performing a project are not present. The project groups are in fact consisting of people from the different departments. Namely; engineering, sales, purchasing and assembly. In addition, there are no project leaders for the structure and process of an innovation project. The managers of the departments are most of the time the responsible person (project leaders). Besides, respondent 9 argued ‘‘Where we need to go is that you make someone responsible for a project or maybe hire independent all-round project leaders’’ (personal communication, 8 June 2022).

To conclude, the innovation function is informally met and can be given a score of reasonable. Project groups are not visible, and the project leaders are the managers of the different departments. Furthermore, innovations can start within different departments. However, most often they do arise within the engineering or sales department.

I2-Regulate innovation

The regulation of the operational implementation of innovations is being manage by the different managers within the MT. For example, the head of engineering or sales. However, according to respondent 3 ‘‘Within Movexx, the project management piece is not been developed yet’’ (personal communication, 9 May 2022). Respondent 9 did emphasize this by arguing the issue of not having standard projects leaders. Also, respondent 9 explained ‘‘Often there is someone from every department who is involved in the project’’ (personal communication, 8 June 2022). Nevertheless, the process of product development is already present in a structured way. Document 2 (Product development process) illustrates a structured process with different milestones of developing strategic new products, customer specific developments and product improvements. This formalization is used by the designated members, who are performing a project. Moreover, employees are working towards a structure with regulated milestones. It was explained that at every end of the milestone important managers are included for the regulation and monitoring of the project. Respondent 3 notified ‘‘So those are all different phases. Typically, at the end of a phase you have one milestone. And with that milestone you want to ensure that, for example, sales or CEO are included’’ (personal communication, 9 May 2022).

To conclude, the regulation of innovation is formally present in a product development process document. Members within a project group are aware of this milestone structured document. However, members are informally selected to work within a project and project leaders are not formally chosen. Most of the time managers of the different departments are responsible for the regulation of innovation. As a result, this function is classified as reasonable.

I3-Propose innovation

Project proposals for innovation are usually coming from the departments of engineering and sales, where sales does the setup of a business case. Respondent 8 cited ‘‘A business case is made and that is where the program of requirements comes in’’ (personal communication, 25 May 2022). This is also visualized in document 2 (Product development process). Within this structured milestone process the different pathways of innovation are always starting with a business case of finding out what the requirements are, maximum selling price, desired release date and determining the schedule. To finally come to a proposal that the project group will introduce to the MT and will agree on or not. These guidelines are provided, but respondent 5 indicates that ‘‘You have to be project-oriented twofold. On the one hand, you have to take an innovation on a project basis. The other side you have to give people the freedom to do innovation without a project’’ (personal communication, 11 May 2022). Employees sometimes should not have the feeling of working formally on an innovation. This might enhance the propositions of new innovations. Eventually, a balance must be found. Lastly, respondent 9 argued ‘‘But I do think we'd better finish something before moving on to the next project’’ (personal communication, 8 June 2022). Moreover, The proposals of new innovations should sometime be stopped to finish the unfinished projects. Also, according to respondent 3 ‘‘Actually the way in which the projects are approached is not fixed’’ (personal communication, 9 May 2022). Therefore, proposals of new innovations are given but how it should be approach or which people should be selected is not clear.

To conclude, this function is informally fulfilled within Movexx International. Nevertheless, it is close to formal due to the use of a business case and the structured document of milestones. The approach of the project proposals are not fixed and should be improved. Hence, it scored reasonable on this function.

I4-Search future new options

The exploration and market search for new innovations is done by the sales department. Respondent 5 noted ‘‘First we look, within the framework of that customer, whether there is

potential in the market'' (personal communication, 11 May 2022). An example of that is the Bed mover machine (electronic aid of moving hospital beds). Respondent 1 argued ''A focus has been put in the Bed movers, and this demand came from the market'' (personal communication, 4 May 2022). However, this product was not a success because the competition was too strong. Respondent 9 explained ''We thought we were smarter but we were not, we missed the boat. In doing so, we sometimes gave too much priority to customer-specific questions, as a result of which we did not complete the Bed mover project'' (personal communication, 8 June 2022). The intention was good, but the execution was badly performed. Therefore, Movexx International does have the Product development process (document 2) for structuring their projects. This document initiates the roadmap of doing a well performed market research by the sales department. Where the analysis of an exciting products and competitors is done by the engineering department. Furthermore, according to respondent 5 ''The Netherlands is the development playground for the rest of the world'' (personal communication, 11 May 2022). The Netherlands is the market of Movexx International where they do their research and exploration.

To conclude, the search for future options is being executed by the sales and engineering department. This is formally structured in document 2 (Product development process). Nonetheless the execution, due to customer specific orders, will not always proceed successfully. As a result, this function is given a sufficient.

C1-Remember

This function is distributed among all the employees. The data of codified knowledge is not being stored nor accessible. Respondent 1 notified ''We have trouble with tracking down knowledge. The knowledge is in people's heads not in a system'' (personal communication, 4 May 2022). Employees are most of the time searching for the right protocols, data or documents, this does take a lot of time. Respondent 2 agreed and added ''What I do run into is that practical knowledge and engineering knowledge often develop things that I have seen before'' (personal communication, 9 May 2022). Furthermore, a problem is of not knowing what the status of a machine is and the missing knowledge of positive/negative feedback from customers. Respondent 1, 5 and 6 argues that it would be good to have some feedback into a storage program about the status of a machine, ''I do not get any feedback from customers. Sales does say; no hearing is good hearing'' (respondent 1, personal communication, 4 May 2022) . Nevertheless, Movexx International started to see this problem and is moving to more documentation. Respondent 5 explained ''Now we working on getting ISO (International

Organization for Standardization), so we're moving a lot more towards procedures and also recording'' (personal communication, 11 May 2022). This step towards more standardization is positive and that is what the employees are also noticing. Employees would like to have an easy assessable data storage for documentation or other information. Respondent 4 says ''Indeed, to be able to click on a total overview yourself that would be nice'' (personal communication, 10 May 2022).

To conclude, the remembering function is informal and insufficient. The employees are not able to search easily into stored data of products. Also, important protocols and documents are missing, most of the time this is stored in people's minds. As a result, some innovations are being replicated without them knowing.

C2-Tune

Tuning an innovation is, because Movexx International is not that big of a company yet, still manageable. Although there is no overview of older information or protocols, today they make use of a resource planning. Respondent 3 cited ''So what we've built now is a whole resource planning. So, it contains all the projects that we are currently going to do. If it is not there, we will in principle not do the project'' (personal communication, 9 May 2022). This will tune the functions of V1 and I1 for a smooth implementation. The execution of tuning an innovation is done by the MT. Respondent 7 explained ''MT meets once a month and once every three months the supported functions are also included'' (personal communication, 18 May 2022). Due to this communication between different managers, it is possible to get people on the same track. In addition, every first Monday of the month a staff meeting is being held for all the employees. Document 3 (business meeting 09-05-22) does illustrate the importance of transferring information to employees about innovations within the company. Respondent 6 mentioned ''Staff meetings are for discussing the progress and business'' (personal communication, 16 May 2022).

To conclude, this function of tuning other functions is performed formally and sufficient. Meetings between the different managers are being held and the supporting departments are involved every 3 months. For a smooth implementation of projects, a resource planning is made and all the employees are getting updated once every month.

C3-balance

Balancing the innovation projects is done by the MT. However, the CEO is the person who decides if the project is going to be stopped or proceeded in consultation with the MT.

Moreover, the CEO is the one with the final responsibility. The employees can give their opinion about the decisions that are made. Respondent 5 mentioned ‘‘Every quarter you have an update with long-term goals, every month a staff meeting’’ (personal communication, 11 May 2022). Furthermore, the smaller exploiting innovations do not go by the MT or CEO. Respondent 7 argued ‘‘The small improvement are carried out during work, not really a project team is set up. The PRG group handles that and directs it’’ (personal communication, 18 May 2022). Respondent 4 also emphasizes this ‘‘Management makes the decisions, unless it is of less relevance’’ (personal communication, 10 May 2022). The problem of not having specific standard project groups and projects leaders does make it happen that engineers might make their own decisions. Respondent 6 does give the argument of doing his own project management. He stated ‘‘It runs from engineering, because we don't have a project manager. We are doing our own project management’’ (personal communication, 16 May 2022).

To conclude, the explorative innovations are formally structured, and it is clear who is making the decisions of stopping or proceeding. Nevertheless, sometimes employees feel that they must do their own project management. The exploiting innovations are also formally structured and people in the PRG group are making the decisions. As a result, this function is sufficient present at Movexx International.

C4-Define mission

Drawing up the mission vision and goals for the future is done by the MT. An example of a vision for the future is, Movexx International wants to work according to the principles of ISO. According to respondent 8 ‘‘We will work with ISO in the future’’ (personal communication, 25 May 2022). This vision has been set during different MT meetings. In these meetings targets for the future and possible new innovations are discussed. Respondent 1 explained ‘‘MT is looking at what they want in the future. They meet every 3 months to determine the goals for the 3 months’’ (personal communication, 4 May 2022). However, a structure for the visibility of missions, visions or targets is not available. The problem occurs that the employees are not at the same level, and they are not pointing in the same direction. The CEO insists on focussing, but the focus is not present at all the employees yet. Respondent 3 mentioned ‘‘If I ask a colleague to name the mission, vision and targets at this moment, I do not really get a clear answer’’ (personal communication, 9 May 2022).

To conclude, the MT meetings are there for the discussions about the missions, visions, and targets. For the future Movexx International is focussing on getting more standardization and structure into their processes. However, the communication of function C4 is not going very

well. Employees are sometimes not thinking about the same targets. As a result, this function is informally present and is reasonable.

Continuous improvement

The small-scale improvement within the operational regulation are mostly done within each department. In addition, document 4 (Change process_V1) does illustrate that Movexx International formalized the procedure of small continuous improvements. This document gives the opportunity for all employees to initiate an improvement. This will be assessed by the PRG group. The coordination of improvements is handy, because it can be decided to implement the improvement right at that moment, or that it will be moved to the annual update. Respondent 5 explained ‘‘if there was an update, we immediately implemented it, but we actually want to go to 1 time in the year that you really take all potential improvements in one go’’ (personal communication, 11 May 2022). Nevertheless, if the small improvements does get more attention, it will get of the expense of radical innovation projects. Therefore, respondent 3 commented ‘‘So I think we should pull that out and make sure we hire someone for that on a project basis. Because he or she can then do that kind of work again and we will of course advise that person’’ (personal communication, 9 May 2022).

To conclude, the continuous improvements within the operational regulation are conducted formally. Nevertheless, a pitfall is that when you spend too much time on small improvements it could be at the expense of the radical innovations. As a result, this function is sufficient.

MIOS Function	Present Formal/informal	Degree of functioning
V1- Supply product service	Formel	Reasonable
V2- Regulate supply	Informal	Sufficient
V3-Propose improvement	Informal	Sufficient
V4-Search improvement	Formal	Good
I1-Innovation	Informal	Sufficient
I2-Regulate innovation	Formal	Reasonable
I3-Propose innovation	Informal	Reasonable
I4-Search future new options	Formal	Sufficient
C1-Remember	Informal	Insufficient
C2-Tune	Formal	Sufficient
C3-Balance	Formal	Sufficient
C4-Define Mission	Informal	Reasonable
Continuous improvement	Formal	Sufficient

Table 5: Summary MIOS functions

4.4 Innovative ability

For the analysis of the innovative ability of Movexx International, the operationalised dimensions (see appendix 3) are used. The dimension of ambidexterity has the indicators of exploitation and exploration. And the dimension of innovative type/level includes the indicators of creativity and renewal. As a result, the innovative ability can be explained and linked to the diagnosed organizational and innovation structure (Appendix 8 for a summary).

Ambidexterity

Movexx International is a manufacturer company that is traditionally dedicated to the explorative (radical) innovations. Respondent 9 mentioned ‘‘My father (founder) used to do it like this, when he saw something he developed it and then he moved on to the next product’’ (personal communication, 8 June 2022). The intention is that this innovative mindset will come back but in a different form, with more structure and a CtO oriented business model. However, today the shift is increasingly moving towards the exploitative direction. According to respondent 3 ‘‘I think it's 60% product development and 40% more radical innovations’’ (personal communication, 9 May 2022). The intention is that it must be in balance to function as a healthy company. This might be the reason why the innovation project Bed mover did not succeed. The members of the organization are too busy adjusting the little things. Respondent 3 noted ‘‘The political answer is that I think I am too little concerned with radical innovations. As a product developer you always try to think steps ahead. Which by definition means that you have to keep producing new products’’ (personal communication, 9 May 2022). This leads to the effect that the customer specific products might cause too many adjustments to the production/innovation structure, and it ensures that there is less time for the radical projects. Respondent 6 agreed upon this argument ‘‘Coming up with real new things, that doesn't happen much. It is more improving the quality and lowering the cost’’ (personal communication, 16 May 2022). Nevertheless, respondent 1 argued ‘‘You do notice that the customer-specific part is an advantage of Movexx. Because other companies may not be able to realize it and Movexx can’’ (personal communication, 4 May 2022). So, for the future the customer specific orders could still be important for Movexx International. However, it is thinkable to base the customer specific order structure on just the hooks instead of creating other customer specific parts. To be more specific, create more time for exploration within the company by deleting the small customer specific exploitative orders.

Furthermore, project teams execute the current division of explorative innovations, which mainly consist out of the engineering department and sales department. These projects are then regulated by the MT or by the head of sales, or the head of engineering. Despite this,

the members of an explorative innovation are self-managing because Movexx International does not use independent project leaders. The exploitative innovation or the improvements are done on every level of the organization. Members of the organization can carry out the small improvements. Also, document 4 (Change process_V1) shows the process of initiating small exploitative innovations. These requests are reviewed by the PRG group to see if it needs to be fixed directly or that it can be fixed at the yearly machine updates. Respondent 7 explained ‘‘The machine updates are every October so that we are ready in November, that we can inform the dealers’’ (personal communication, 18 May 2022)

Innovation type/level

Movexx International has entered a phase of growing from a small sized manufacturer company towards a medium/bigger sized manufacturing company that is operating throughout the world. For the growth of the company, it is important to stay creative. Respondent 1,2,4 and 8 did mention that Movexx International is a company where creativity is of paramount importance. To illustrate, respondent 2 argued ‘‘Innovation is in the DNA of the company and the organization (personal communication, 9 May 2022). Also, the culture can be described as open and small. According to respondent 7 ‘‘ Yes we are pretty straight here, it's a bit approachable. Everyone walks in by everyone. So yes, there are very short lines’’ (personal communication, 18 May 2022). Moreover, employees feel free to be their creative selves. This positive feeling of creativity will, according to respondent 1, not disappear with the arrival of a CtO structural design. Respondent 1 noted ‘‘I do not think that the innovation of this company has been removed with the new CtO structure. In any case, I do have the right programs and knowledge to be able to be creative’’ (personal communication, 4 May 2022). An action taken to maintain the creativity level, by the MT, is the introduction of a bonus system. Respondent 4 explained ‘‘What they are currently working on is a bonus system. Each department is given certain objectives, but they are also drawn up by the department itself or the adjacent department’’ (personal communication, 10 May 2022). Every department should create 2 or 3 quarterly targets that they can achieve. If every department achieves all the targets the whole organization will receive a bonus.

A potential threat for the structure and the organization is the shortage of employees. To be able to grow and stay creative, the company should make sure that employees have enough freedom to be creative. Nevertheless, respondent 8 mentioned ‘‘Overall, I'm not satisfied with my own role. And that's really just because I have to hold multiple positions. So hats off and on. That's why I don't have enough time to just do everything right’’ (personal communication,

25 May 2022). This is in accordance with respondent 3 ‘‘Extra people needed in the field of engineers’’ (personal communication, 9 May 2022). Due to this shortage, process, product, business, and market innovation might slow down. Respondent 2 noted this ‘‘I am happy that I can be innovative here. I still think the execution is on the slow side. I have the feeling that the bigger we are, the more difficult it becomes to achieve a certain goal’’ (personal communication, 9 May 2022). As a result, it does not benefit the original strength of Movexx International, the product innovation efforts. To maintain the product innovations, it is important to increase the quality of the processes within the organization. The type of renewal is mainly focused on the product and market innovation. The process innovations are a bit behind at Movexx International. Respondent 4 cited ‘‘I think you can gain a lot here at Movexx mainly on innovation within the processes’’ (personal communication 10 May 2022). Respondent 7 emphasizes this ‘‘Certainly in the process area it could be better. Well, we'll emphasize that here too. Hence the ISO’’ (personal communication, 18 May 2022). This idea of creating more innovation within the processes does affect the organizational and innovation structure. CtO modular design enables less customer specific innovations. Respondent 6 added ‘‘In the normal production process there is no innovation needed in my idea’’ (personal communication, 16 May 2022). So, for the creation of less innovation (customer specific orders) within the primary order process, it could enable more time for the engineer department to be creative and innovative. Where respondent 2 agreed on ‘‘We have ideas, but then we just don't get around to them. Sometimes not enough time’’ (personal communication, 9 May 2022).

4.5 Comparison actual and desirable situation

This section will elaborate on the comparison between the actual organizational/innovation structure of Movexx International and the desirable organizational/innovation structure, what arises from the theory explained in chapter 2. First, the organizational structure will be discussed according to the principles of De Sitter (1994). Secondly, the innovation structure regarding the thirteen functions of MIOS (Lekkerkerk, 2012) and thirdly, the effect on the innovative ability.

Organizational structure

Based on the results and analysis, which are described in section 4.2, it can be concluded that the actual organizational structure at Movexx International deviates from the desirable. The desirable situation is an organizational structure with low parameter values, which will contribute to a low probability of variety and disturbances, and a high probability of regulatory

potential within the primary order process. The current organizational structure of Movexx International is valued as potentially being problematic in the future. The operational production structure is valued high on parameter 2 and average on parameter 1 and 3. The control structure is performing a bit better. Currently, parameter 5 is valued as problematic. Parameters 4 and 6 are low and therefore seen as not problematic. The parameters of separation between production and control structure are scoring a value of average. This indicates that regulatory and operational activities are somehow separated within the organizational structure.

Innovation structure

As table 5 shows, only MIOS function 'V4-Search for improvement' is formally present and function good. The rest of the functions are deviating. The desirable situation of an innovation structure is that the functions are assigned formally among the people of the organization and that they are operating good. As a result, the preparatory, innovation and control of an organization can be assessed as not problematic. However, Movexx International is not performing as desirable as it should be. The most problematic function within the structure are V1, I2, I3, C1 and C4. The rest can be considered as potentially being problematic and must be monitored. These problems within the functions can be related to the structure of the organization, and to the problem of focussing too much on the small improvements. To illustrate, 'I2-Regulate innovation' is formally present but is functioning reasonably. This is because there is a structured document with project milestone visible for employees. Nevertheless, the execution of innovation projects does not happen with project leaders or standard project teams. This example shows that if Movexx International want to change and improve their processes, the innovations should be structured and formalized to move away from the small customer specific problems and move towards dedicated well designed innovations.

Innovative ability

The innovative ability of Movexx International is traditionally dedicated to explorative new product developments due to the customer specific orders. Moreover, creativity and the innovative mindset is part of the DNA of Movexx International. Today, the company is growing and it would like to increase their sales orders. However, Movexx international had lost their sight regarding to process innovations and they are now catching up with it. They are introducing more structural processes and newly introduced production methods. So, the desirable innovative mindset within Movexx International is to get back to a high level of product innovation and explorative initiatives. The CtO business model might help with that. It

is intended that the customer specific orders should be lowered in the future. This would increase exploration time, dedicated innovative projects and the innovative abilities. But today Movexx International is not at that level yet. The members of the organization are feeling creative and innovative. However, it is mentioned that members are having trouble with their division of time. There are simply not enough employees available for the targets of increasing their sales orders and to increase their innovative power. To illustrate, respondent 8 argued ‘‘Overall, I'm not satisfied with my own role. And that's really just because I have to hold multiple positions. So hats off and on. That's why I don't have enough time to just do everything right’’ (personal communication, 25 May 2022).

4.6 General summary of the analysis

The organizational structure of Movexx International is with the current desire to grow and the desire to be CtO structured problematic. The quality of the organization and work should be improved. The order process is too much issue based, and problematic disturbances are visible. For example, the communication between the sales department and the engineering department is not going too well regarding the customer specific orders. The control structure of Movexx International can be considered as potentially being problematic. The regulatory potentials are not so differentiated into parts nor specialized due to the size of the organization. The members feel autonomously and there is a culture of employees that dare to raise and solve problems themselves.

The innovation structure is linked to the principles of L-STSD. To remain viable and innovative for the future, the functions of MIOS should be formally present and performing good. The majority of the functions are formally present and are operating sufficient or reasonable. The main problematic functions are V1, I2, I3, C1 and C4. These problems does have an influence on the innovative ability within Movexx International. The main effect is that the organization is more focused on the exploitative innovations or improvements, instead of being dedicated to the explorative or radical innovations. However, this should be improved by the new modularity process train of thoughts. To illustrate, the engineering department might get more time to develop radical innovations instead of having to solve small improvements every time. As a result, the creativity level and time to spend on an innovation project will increase.

| Chapter 5: Conclusion, recommendations & discussion

This chapter will start with answering the main research question and their related sub questions. Thereafter, the recommendations are given for improving the organizational- and innovation- structure when moving towards a CtO business model. These recommendations are based on the results and their analysis from chapter four. The third and last section will elaborate on the discussion, including the suggestions for further research.

5.1 Conclusion

In section 1.1 the objective and main research question is formulated. The theoretical and practical sub-questions are linked to the main research question. The theoretical sub questions are:

- What is an organizational- innovation- structure?
- What are the innovation projects and structure within an EtO modular system?
- What are the innovations projects and structure within a CtO modular system?
- What are the differences of innovations between EtO and CtO modular system?
- How to deal with the decreasing or increasing innovative ability when changing to a CtO modular system?

The first sub-question has been answered in section 2.1 and 2.1.1. Here definitions are given for innovation and organizational- innovation- structure. Section 2.2 explained the innovative ability and their relation to the organization. Moreover, this section is answering sub-question five. A definition is given along with important dimensions that are attached to it, which gives a clarification of the innovative ability within an organization and how to deal with it. sub-questions two and three are discussed in section 2.3. An extensive explanation was given about the structures of EtO and CTO modular system designs, and how innovation is organized in it. To then elaborate, in section 2.4 and 2.5, on the differences of innovation between EtO and CtO structures, which is related to sub-question four.

To diagnose and analyse the organizational- innovation- structure at Movexx International, empirical sub-questions have been formulated in section 1.1. These sub-questions are answered with the help of the two diagnostic models explained in section 2.7 and 2.8 (L-STSD & MIOS). The answers to the empirical sub research questions are formulated in the analysis, chapter four. Which in turn provides the answers for the recommendations made in section 5.3. The empirical sub-questions are:

- How does the organizational- innovation- structure at Movexx International look like?
- How does the organizational- innovation- structure of Movexx International affect the innovative ability?
- What recommendations can be given reflected on the organizational- innovation- structure at Movexx International?

The main research question that is being answered in this study is:

''What should change in the organizational- innovation- structure of Movexx International when it moves from an Engineer-to-Order (EtO) business model to a Configure-to-Order (CtO) business model and what is its influence on the innovativeness?''

By means of the analysis in chapter four, it is important to lower some of the organizational parameter values. It should decrease the variety in orders within the primary order process, the disturbances and increase the regulatory potential among the employees. As a result, the flexibility and the quality of the organization, work and work relations might increase within the organization. Which does influence the innovation structure and their ability to innovate within an organization. According to Lekkerkerk (2012), when the organization is structured well, the innovation efforts can also be improved. The organizational structure within Movexx International is described as a decoupled-line structure with a semi-homogeneous order flow (see appendix 4 for the Meso & Micro structure). Therefore, to move towards an CtO structured business model, the process of parallelization and segmentation will allow the change towards a flexible organization. Hence, a flexible organization will be able to cope with the disruptions where they arise (low in the organization).

Two of the eight diagnosed structural parameters do have a low value. These are; parameter 4: differentiation of regulatory tasks into parts and parameter 6: specialization of regulatory activities. This does indicate that the controllability within Movexx International is not a problem. However, parameter 5: differentiation of regulatory tasks into aspects is valued as high. Furthermore, the parameters of the production structure at Movexx International are valued as average or high. The orders are related to all the departments in the primary process in which production, preparation and support activities are assigned to different tasks. Despite this, the rage of tasks within these departments are less specialized. Due to small number of employees, members of the organization are having a wider palette of tasks to perform. The separation between production and the control structure is average present. The managers of different departments are responsible for the regulatory and operational activities, where the control functions of observing, criticizing, and intervening are woven into the processes.

The innovation structure of Movexx International indicates to be generally sufficient or reasonable. The functions where the most attention should go to are V1-Supply product service, I2-Regulate innovation, I3-Propose innovation, C1-Remember and C4-Define mission. These functions are decreasing the innovative ability at Movexx International, which is associated with the creativity and renewal of the organization. What emerged as the main issue is, not having the right structures to support innovations and making it almost impossible to store the right documentation, protocols, and innovations. Because of that, Movexx International is too busy with the small improvements/ innovations where they should actually have to find that balance between exploration and exploitation.

5.2 Recommendations

The recommendations that are given are based on the analysis in chapter four with explicit attention to the difference between the actual and desirable situation. These recommendations will reflect what needs to change in the organizational- innovation- structure at Movexx International to remain viable for the future, to increase their innovative ability and to move without problems towards a CtO structured business model. Take into account that more staff needs to be recruited in order to realize these recommendations.

Organizational structure

The main principle of a CtO approach is to standardize products with specific specifications that are pre-made by the research and development/design team. Therefore, Movexx International should separate their customer specific order flow and their configurational order flow. These two parallel streams will include production lines which are sorted by product groups, and in which sales and engineering have been eliminated from the primary order process. Sales will not be eliminated completely out of the process, they will still act as a supporting function. The purchase department will be seen as a preparatory function where they will manage the stock. The customer specific order flow will manage the customer specific requests. Those requests are most of the time customer specific hooks. Moreover, the customer specific flow will be structured in the same manner as the configurational order flow, but here specialized members of the organization must be selected that can engineer the customer specific hooks, without being part of the engineering team. Finally, because respondent 9 mentioned ‘‘We want to get 80 percent of the products across the line for the future. The 20 percent are then the specials, such as the hooks’’ (personal communication, 8 May 2022), it is thinkable that the configurational order flow will include more members than the customer

specific order flow. Nevertheless, for the customer specific order flow higher specialization is needed with knowledgeable employees.

The recommended restructure of the organizational order process will ensure the following improvements compared to the problematic structural parameters.

- ➔ The production structure parameters will be lowered. All the orders will not pass by all the employees and within the flows the production, preparation and support activities are less differentiated. Also, the teams within the operational process will have less specialization of operational tasks because they will have more responsibilities regarding tasks within the product group. Lastly, the problematic disturbances between sales and engineering will be eliminated due to their disappearance within the primary order process. As a result, they can create more focus on product, process, and market innovation.
- ➔ The control structure parameter of differentiation of regulatory tasks into aspects will be lowered. The production teams within the two flows will have autonomise power to regulate their own flow. Hence, they can intervene, monitor, and assess themselves.
- ➔ The separation between production and control structure will still be visible. Managers are still present to regulate the primary process. Nevertheless, within the newly created production flows employees can observe, criticize and intervene their own work.

Innovation structure

The innovation structure at Movexx International should be formalized and less focused on the small exploitative innovations. Due to the recommended organizational structure described above, the function V1-Supply product service will move towards a good valued function. The newly recommended organizational structure will cause less problematic disturbances and the customer-specific orders will no longer be intertwined with the configurational orders.

To allow I1 and I2 to function properly and formally, it is recommended to introduce project groups with standard project leaders. Because the engineering department and partly the sales department are eliminated out of the primary order process, it is possible to generate these project groups within these departments. Also, these departments are mostly concerned about the innovation projects within Movexx International. The project groups will have more time and will be increasingly committed to explorative projects. The informal allocation of projects will therefore take place formally. In addition, the managers of Movexx International will have more time in managing the company, instead of managing all the tasks within the primary process or project teams. Furthermore, the formal document of the product development process

(document 2), that is already in place, is a good step forward and should be used by the project teams. It is a good illustration of a process with milestones.

For the improvement of function C1 and C4, it is important to store information and documentation properly and formally. As a result, valuable information from exploitative and explorative innovations remains within Movexx International and will not just be stored in people's minds. This direction has already been taken by the introduction of ISO (International Organization for Standardization). Thereby, it is important to store the feedback that is obtained from customers and to communicate it to the departments. whether it is good or bad news. To add some extra force to function C4, it might be important to discuss the missions, visions, and objectives at the beginning of each monthly staff meeting. Resulting in the generation of increased focus, and to get all the members of the organization on the same page.

5.3 Discussion

Whilst there is already a lot known about EtO and CtO individually, the change and its effect on its innovativeness was still underexposed. Hence, this research broadens the knowledge in this spectrum.

In this study, two research models were used to diagnose the organizational- innovation- structure at Movexx International. A Dutch manufacturer company and developer of electric towing aids that takes away physical efforts of employees who had to transport heavy carts and trolleys, and to increase efficiency within a company. The design parameters of De Sitter (1994) are used for the analysis of the organizational structure, and the thirteen functions of MIOS (Lekkerkerk, 2012) were used for the innovation structure. Furthermore, literature linked to the ability for innovation is examined and applied to research the innovative ability at Movexx International.

To answer the main research question *''What should change in the organizational- innovation- structure of Movexx International when it moves from an Engineer-to-Order (EtO) business model to a Configure-to-Order (CtO) business model and what is its influence on the innovativeness?''* a total of nine interviews have been done, in a five week timeframe, with members of the organization that do represent the organizational- innovation- structure at Movexx International. Thereby, seven company documents were selected and a staff meeting was attended. Based on this, it can be stated that if this study were to be repeated, the results would roughly be the same. Moreover, the results of this study are therefore valid.

In general, it stands out that the innovative ability is affected by the organizational- innovation- structure. The organizational structure of Movexx International is both dedicated

to the customer specific orders and to the configurational orders, which can be problematic regarding time management. As a result, members of the organization are too busy improving small issues. The explorative radical innovations might therefore take longer or even fail, what does not benefit the creativity of organizational members. Also, the engineering department is still too much present in the primary order process, where it is actually advisable to leave the engineering or R&D department out of the primary order process. This result may also be at the root of the unavailable formal structures at Movexx International. The innovation efforts are not formalized nor managed within strictly formulated project groups. Which does indicate that the regulation of innovations are in need of being improved.

The focus of this research, of the organizational- innovation- structure and their associated concepts, was exclusively on the internal organization of Movexx International. Therefore, the external environment was not considered, which can influence the internal structures of the organization. To be specific, no conclusions can be drawn about the innovative ability that is being influenced by the external environment. Another theoretical implication is the relation between technological product innovations and their affiliation with the organizational- innovation- structure. This study has emphasized the socio-technical elements for diagnosing the organizational- innovation- structure, which are mainly concerned about the developments of structural and managerial improvements. It did not consider profound technological innovation theories. What would, in turn, come to different conclusions and recommendations.

Due to the findings it seems that the organizational- innovation- structure does influence the innovative ability, but to empower this future research is recommended. The structure of Movexx International is both dedicated to EtO and CtO. Hence, it is advisable to further research the organization- innovation structure, and their influence on the innovative ability, within a manufacturer that is fully operating accordance the principles of CtO. Furthermore, mayor strategic decisions could influence the innovative ability and their organizational- innovation- structures. This study has shown that Movexx International wants to enter the American market. This might have consequences for the organizational- innovation- structures and their innovative ability. So, it is recommended to further research the influence of mayor strategic decisions on the structures and innovativeness of an organization. Finally, this study investigated the organizational- innovation- structure with the expectation of De Sitter's (1994) design parameters having the lowest as possible value and where the functions of MIOS (Lekkerkerk, 2012) are formally present and functioning good. Therefore, it leads to a better organizational- innovation- structure that positively influences the innovative ability. However,

other factors might also play a role. From the interviews it emerged that culture and the history can also play a role in the dedication towards innovation. For that reason, it might be interesting to research the organizational culture/history of an organization and their relation to the innovative ability or organizational- innovation- structure.

| Chapter 6: Practical implications & reflection

This chapter is devoted to the practical (managerial) implications, the reflection, and limitations. In the reflection the various chapters, the decisions taken, personal behaviour will be discussed and are reflected on.

6.1 Practical (managerial) implications

Based on the results, a number of practical implications can be indicated. These implications are the actions that managers can take for (re)organizing their organizational- innovation-structure and to improve their innovative ability.

First, for the growth and change towards a CtO structured organization it is advisable to keep the engineering department and sales department out of the primary order process as much as possible. Members of these departments are often involved in innovation projects. As a result, it will give them more time to work on exploratory (radical) innovations.

Secondly, when (re)organizing the organizational structure the parameter of functional concentration must be remembered. The newly created product flows should not be mixed up. The teams within the production flows do have the regulatory potential do monitor, intervene and asses their own work. Nevertheless, when the structure is not parallelized enough, complex situations may still arise.

Thirdly, train the members of the organization. For Movexx International it applies that when the engineering department is eliminated out of the primary order process. Other employees should be trained and selected to perform the customer specific tasks within the customer specific order flow. In addition, by their vision to grow and obtain more sales in the future. New staff must be recruited to fill certain gaps in the organization and to remain viable for the future.

Fourthly, make sure you have the right systems for storing documentation and protocols. Knowledge about the exploitative and explorative innovations should not be kept in people's minds. Members of the organization should have an easy access to information about different market/product/process innovations that are in progress. Hence, it will benefit the communication within the organization and the long-term goals

Lastly, when an explorative innovation is set in motion, it is recommended to make use of project teams and project leaders. These teams can focus on starting a project, work towards milestones and the completion of a project. The MT of an organization should be involved as little as possible. However, the MT or CEO should still review the projects and decide if it deserves a go or a no go.

6.2 Reflection

The theoretical framework does answer the theoretical sub- research questions that are formulated in section 1.1. The concepts and dimensions used to diagnose the organizational-innovation structure at Movexx International are well defined and led me to insights that benefited the research. To illustrate, ambidexterity is important for the innovative ability of an organization. It means that the organization can cope with radical and incremental innovations. As a result, conclusions could be drawn regarding the degree of exploitation and exploration at Movexx International. Furthermore, The models used in this study, for diagnosing the organizational-innovation structure, did generate adequate findings. However, the design theories of Mintzberg (1980), Thompson (2007) and Achterbergh & Vriens (2019) are discussed, to universally understand different perspectives within the research field of design theories. The theories of Mintzberg and Thompson are considered as not useful for measuring an innovation structure due to the lack of information regarding innovation. Whereas the model of Achterbergh & Vriens (2019) was considerable because it is linked to L-STSD, and it strongly takes innovation within its model. Eventually, MIOS (Lekkerkerk, 2012) was choses, which explains the thirteen function related to preparatory, innovation and control. It was chosen because it is fully dedicated to the diagnosis of explorative and exploitative innovations and their structures. In addition, MIOS is particularly useful due to their connection with the basic activity of 'regulation by design' by De Sitter (1994). For this reason, the model of De Sitter (1994) with its diagnostic eight parameters, is selected. De Sitter (1994) describes design parameters in which it must have specific values for an organization to dampen or amplify their structure. Finally, the theoretical framework did initiate an understandable and informative conceptual model for the visualization of which the independent variable is affecting the dependent variable.

Data collection took place within the boundaries of a single case study. Interviews and documents were selected that would represent the empirical research. The interview questions were semi-structured and related to the operationalization. Therefore, it provided sufficient data to answer the main and practical sub- research questions. This research method in which interviews are executed, can be time consuming. With the limited time available, a total of nine respondents were interviewed. However, it was not possible to interview respondent nine extensively because the interview took place in the last week of my research. There was no time to create an extensive transcript, so the notes remained. In addition, during the interviews the questions were sometimes not clear, and perhaps the models of organizational- innovation-structure should have been explained more in advance.

My personal behaviour as a researcher has been perceived as positive. The contact with members of the organization at Movexx International was experienced as pleasant. As a result, it was possible to create profound and informative interviews. Thereby, informal conversation and seeing the daily practices did also contribute to the correct formulation of conclusions. Furthermore, the content explained in the models of L-STSD and MIOS did lead me to certain questions, which I sometimes did not understand. The feedback that I gained from my supervisor did help me in understanding this content. Also, my supervisor at Movexx International did help me with supporting my research. He made sure that I was introduced to the company, he gave feedback, and ensured a good and reliable environment to conduct my study. I can look back on an instructive and productive graduation time. The subject of organizational- innovation- structural design did gave me insights in the production processes, structures of innovation & organization and their ability to innovate.

6.3 Limitations

The reader should bear in mind that this study is based on the interpretations of the researcher. Moreover, the quality of this research paper might be affected by wrongly interpreted information. Due to this dependability, triangulation is applied. Interviews, documents, and literature are compared with each other to find patterns. Nevertheless, intercoder reliability is missing. The researcher was the only person who coded the data. This might cause wrongly classified codes. In addition, Member checks are performed, information that is given during the interviews are correct and are usable for the analysis of the result. Whereas no peer review is performed yet to improve, verify or control the quality of this research paper by subjecting it to critical scrutiny.

Secondly, the selection of respondents was correctly performed. However, the CEO, an important respondent that should be interviewed for the strategic regulation, was interviewed briefly due to miscommunication and to time constraints. Hence, no time was available to transcribe the interview and only its note is saved for the coding process.

Finally, it should be considered that the results of this research paper might incorporate hindrances. The initiated recommendation of reorganizing the organizational structure at Movexx International is asking for members of the organization to perform a few complex jobs. Knowledgeable members should be selected or trained. This may become a difficulty in the future. Furthermore, it is advisable to hire new employees to fill the gaps that can be caused by the recommended structure.

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| Appendix 1: Selected documents

Document	Content
Doc 1	Configurator flow-full process overview
Doc 2	Product development process
Doc 3	business meeting 09-05-22
Doc 4	Change process_V1
Doc 5	Sales process EtO_CtO_Elfsquad_all
Doc 6	organization chart Movexx International
Doc 7	General company process

| Appendix 2: General interview guide

This general overview is a basic interview protocol created by Lekkerkerk (2012, p. 281-283) and is used as a starting point for the creation of a respondents specific interview guide. Every respondent is in need of some differentiation in their interview questions because the respondents are employees of different departments with different expertise's. However, here are the overall questions present.

Basic Interview Protocol with …… at Movexx International

1. ***acquaintance and introduction***

Researcher: Jesse van der Huizen, 27 years old, master student business administration at the Radboud university Nijmegen. The master specialisation is Organizational design and development. Before the master I studied International Hotel management.
Research: Innovation and organizational structures, EtO and CtO modular systems and diagnosing the innovation and organizational structure at Movexx International with the help of MIOS and L-STSD.
Interview: 1 or 1,5 hour max. recording for efficiency and reliability internal reporting public (or anonymous?).
Answers: There are no wrong answers; how you see and experience it "I don't know" can also be a very good answer

*** Is everything clear so far? or do you want to ask something before I start recording? ***
**********turn on recorder now**********

Record: This is the interview with [respondent], [position] at [company] held on [day/date] explanation: Did you receive and read the explanation? Do you have questions about my definitions? (see basic interview guide). Do you see these concepts differently? Do your colleagues see the concepts differently from you? Do you have questions about the model and the functions?

2. ***job-related additional questions***

➔ Can you tell something about yourself?

- What is Your function?
- What are Your daily tasks?
- How long have you been employed?

3. organization-related additional questions

First of all, let's take a look at the definitions of innovation in my research. Do you agree with this?

➔ Definition of innovation:

- ‘‘Innovation includes project-based development and realization of both technical such as organizational or social innovations and policy management of it’’.

➔ Definition of innovation structure

- The innovation structure is a structure with functions that are linked to the production structure, which is considered as a ‘control activity’, with explorative and exploitative innovations.

Now we move forward to the questions related to MIOS and L-STSD

➔ Production structure parameters & MIOS V1

- How many projects/products are you involved in?
  - ❖ How many projects are there? In product groups?
  - ❖ How do these product groups proceed? Through all departments or is there a specific flow per product group?
- How many different tasks and roles do you have within these projects/products?
  - ❖ Are these make/create, Support or Preparatory?
- Are you involved in the entire product/project process or a small part?
- Which part of the projects/production is CtO oriented and which part is EtO oriented?

➔ MIOS C1

- What is your function within an innovation project?
- How do you store important knowledge in the organization? How is knowledge about previous successful and unsuccessful projects recorded within the organization?
  - ❖ How do you use this information?
  - ❖ To what extent is this established within your department?
- Do you have any idea what the project decision-making process looks like?
- How does Movexx International deal with their environment in combination with projects?
- Does Movexx generates dependency among customers or is it having a dependent position.

➔ Control structure parameters & MIOS V2, C4

- Which role belongs to you?
  - ❖ Monitor, assess or intervene?
- What are you involved in?
  - ❖ formation of the strategy
  - ❖ Designing a project

    - ❖ Organize your own tasks
- How do you deal with disruptions in the primary process within your department?
    - ❖ To what extent are you allowed to make changes to the primary process, protocols and/or procedures yourself?
    - ❖ How are tasks to deal with disruptions in the operational primary process distributed within your department?
    - ❖ To what extent are small improvements part of the duties of all employees in your department?
- Would you say you are more involved in operational activities or more involved in regulatory activities (monitoring, reviewing and criticizing)?
- Do you think your operational tasks and regulatory tasks are in balance or do you see an imbalance, and why?
- How do you think missions, visions and goals are formulated in the organization?
    - ❖ What contribution do you give to this?

➔ <u>Exploitation & MIOS V3, V4</u>

- Do you think along about incremental (ongoing) improvements in the organization?
- How do you communicate improvements to the organization?
    - ❖ Is there a certain process? Who is involved?
- Can you indicate to what extent it concerns ideas in the field of product, process and organization?
- How are the better ideas determined to improve existing products, processes, organization and knowledge?

➔ <u>Strategic regulation & Exploration & MIOS V3, V4, I1, I2, I3, I4, C2, C3</u>

- Are you involved in innovation projects and what is your role?
    - ❖ Who else is involved?
    - ❖ To what extent are ideas translated into a project or investment proposal?
    - ❖ What kind of ideas are usually involved?
    - ❖ Are you exploring the possibilities for new markets/projects?
    - ❖ Do you determine which innovations will and will not be accepted?
- To what extent are innovations implemented in project form within your department?
    - ❖ Can you indicate the impact of innovation projects within your department?
- Do you deliver these innovations to the organization, and if so, how do you do this?
    - ❖ How are innovations implemented in the organization?
- Is there an overview of innovations (portfolio) that can be applied in future activities?
- Are you involved in determining which new projects to start and which ongoing projects will continue, be paused or even terminated?
    - ❖ To what extent are you ultimately responsible for innovation and investment projects?
- How are the new innovations controlled according to your knowledge?
    - ❖ Is there an evaluation activity on what could be done better in the future after a project has been completed?

- How is a balanced and executable policy plan established at your department level, based on mission, vision and objectives, in which a choice is made from proposals for existing knowledge improvements or radical innovations?

➔ <u>Innovative ability</u>

- Are you satisfied with your role and current situation within the company?
  - ❖ Do you work content in the current innovative environment?
  - ❖ Do you see Movexx and yourself as innovative?
    - ➢ Incremental (continuous improvement) or radical (new innovative ideas)
- Are there sufficient resources by the organization to be innovative?
  - ❖ Both for customer specific products and configuration products?
  - ❖ Is it possible to be creative?
    - ➢ Individually? Group? Organizational? Environment?
- Is it possible to be innovative (renewal)?
  - ❖ Product, process, Business level?

4. closing questions and closing

Did I forgot a topic that is important for the internal organization of innovation? Would You like to say something about the topic that is of importance, that I have not yet asked? May I call or e-mail you if I do not understand something during the elaboration?

I have agreed with [name] about the report: …

Thank you for your time and sharing your knowledge!

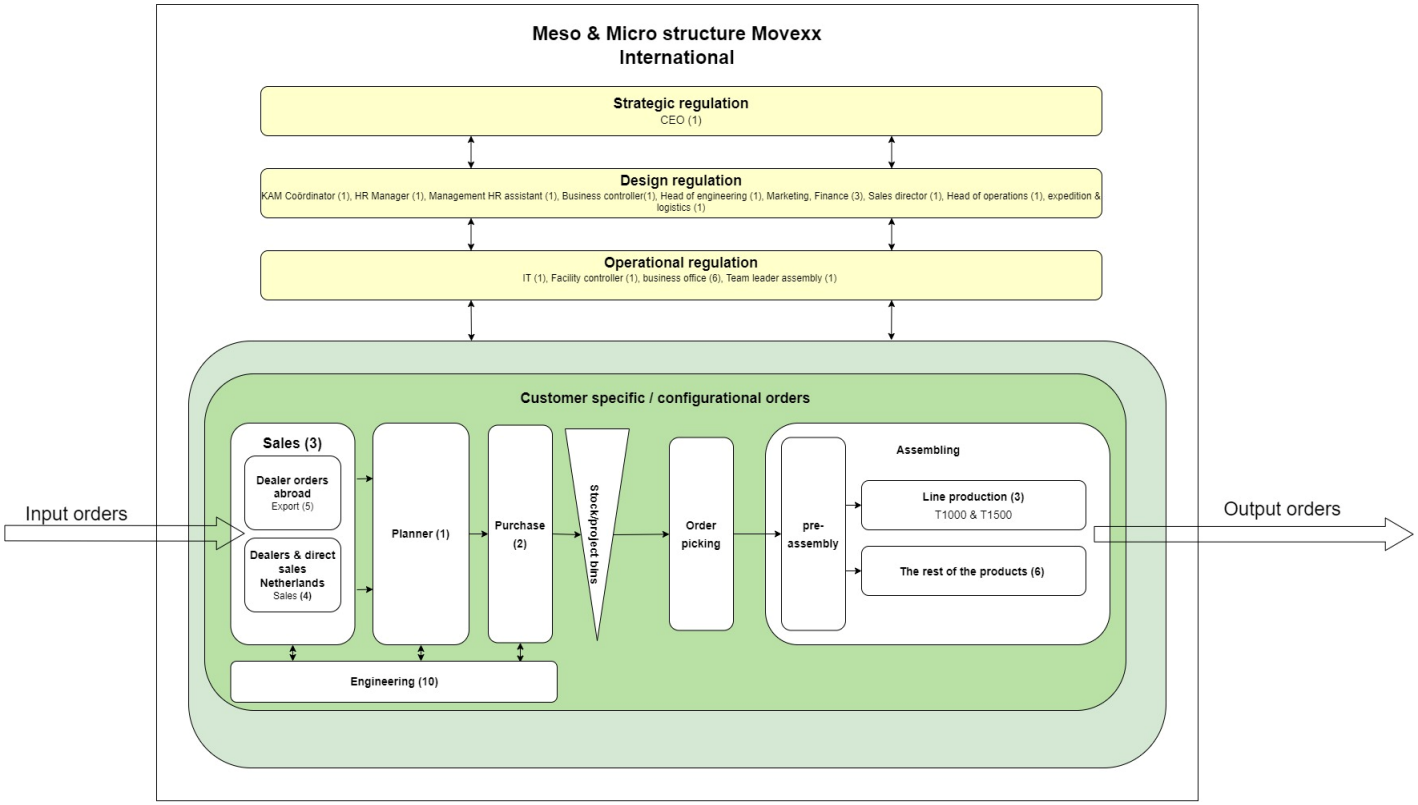
**********turn off recorder now**********

| Appendix 3: Operationalization

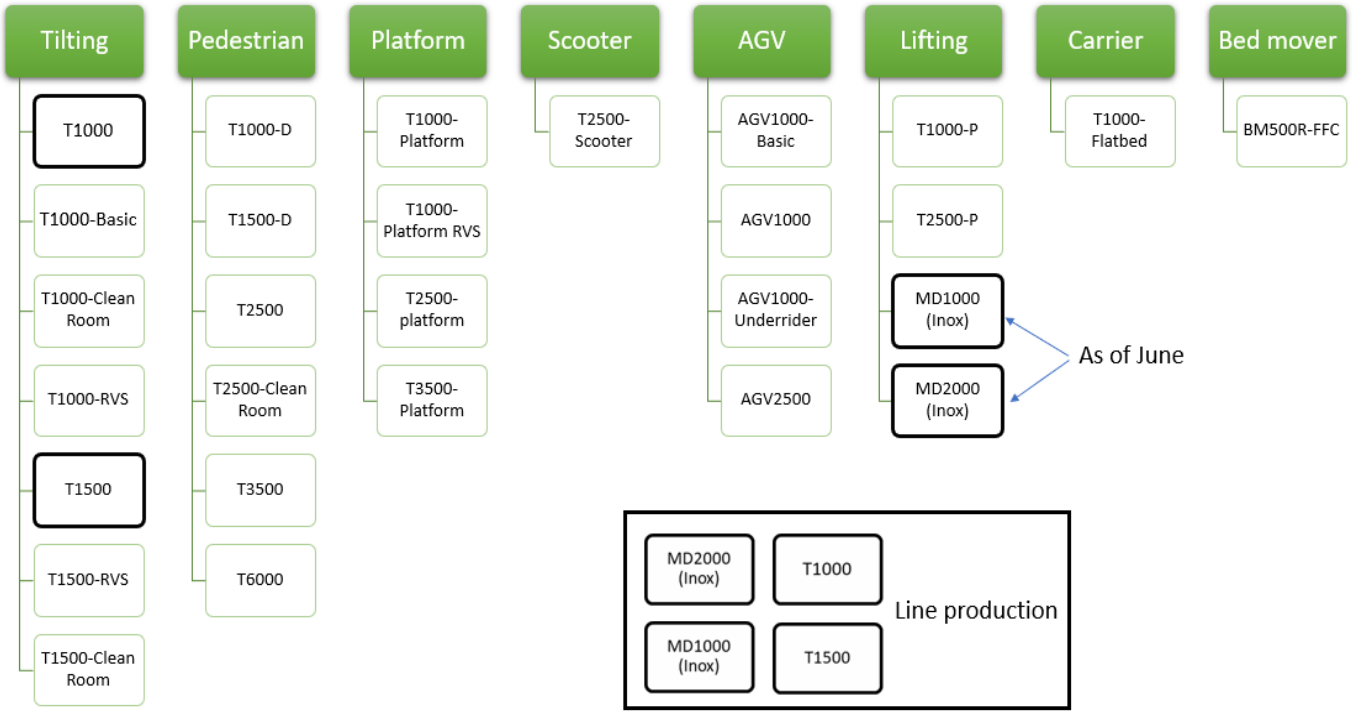
Concept		Dimension	Indicator
Innovative ability		Ambidexterity	Degree of exploitation
			Degree of exploration
		Innovation type/level	Creativity level
			Type of renewal
Organizational structure	**L-STSD**	Degree of functional concentration	Degree to which operational tasks are related to all (external/internal) orders
		Degree of differentiation of operational tasks	Degree to which production, preparation and support activities are assigned to different tasks
		Degree of specialization of operational tasks	Degree to which operational activities are split up into tasks covering only small part of the operational process
		Degree of differentiation of regulatory tasks into parts	Degree to which regulatory activities 'monitoring' 'assessing' and 'intervening' are assigned to different task
		Degree of differentiation of regulatory tasks into aspects	Degree to which 'strategic regulation', 'regulation by design' and 'operational regulation' are assigned to different tasks
		Degree of specialization of regulatory activities	Degree to which regulatory activities have only small regulatory scope (i.e. cover only a small part of the operational process, or only a small set of other regulatory tasks
		Degree of separation regulatory and operational activities	Degree to which regulatory and operational activities are assigned to different tasks
		Degree of separation per control function	Degree to regulate or control can be depicted as a control cycle with different steps (observing, assessing and intervene)
		V1 Supply product service	Primary process, supplying products and services by transforming inputs into outputs. These are order-related and supporting activities.
		V2 Regulate supply	Operational control and continuous improvement of the primary process.
		V3 Propose improvement	Development of project plan for exploitation options received from V4

	MIOS	V4 Search improvement	Searching for exploitation opportunities to improve current products, markets, processes etc.
		I1 Innovation	The implementation of innovation projects.
		I2 Regulate innovation	The operational regulation of the innovation projects and the innovation portfolio.
		I3 Propose innovation	Working out the project plan/proposal for exploration options.
		I4 Search future new options	Exploring the organizational environment for future options of innovation aimed at existing or new markets.
		C1 Remember	A memory function. Storing relevant knowledge for the organization
		C2 Tune	A directing function. Tune V1 and I1 enabling smooth implementation of innovation. Also, tune the upper six functions for the contribution of the strategic planning process
		C3 Balance	Adopts a balanced, feasible policy. Choosing which new proposals (V3 and I3) should be funded and which projects, that are in progress, should be continued stopped or paused.
		C4 Define mission	Formulating mission, vision and goal(s). including lower level strategies for supply and innovations for the performance indicators and budgets.
		Continuous improvement	Small scale improvement or 'Kaizen' activities within each functions operational regulation

| Appendix 4: MESO & MICRO Organizational structure



| Appendix 5: Product Portfolio



| Appendix 6: Summary analysis structural parameters

Parameter	Value	Quotes	External functional requirement
Functional concentration	Average	- all products that require a specification will come through me. (R1) - So those are actually the two streams that you can distinguish within sales; the dealer order abroad and sales direct Netherlands. (R2) - On sales area, no. Everyone sells everything. In terms of work preparation, no. I put everything in the system. Engineering field, it is somewhat linked to a permanent engineer (R4). - We have a production line in production and that's where we actually do the T1000 and the T1500 machines (R4) - Because in the normal order flow you are actually not involved as engineering (R3) - But I can actually say that we don't have 1 person 100% on one segment by default (R5) - No, I specifically have the MD the modular machines and the T1000 (inox). So no, I don't see everything that passes by. (R6) - yes those are the runners of the company. So the T1000 and the T1500 (R8)	Quality of organization
differentiation of operational tasks	High	- Preparatory is when we see a market in the future, we have a market in mind where we can add value and that is what I call preparatory. (R2) - Preparatory is by far the number one. (R4) - so we are just making and creating and then we support a bit (R3) - Defining a product, preparing it and making sure everything is in the system. Is simply preparing the production. (R6) - Preparing. But I do make my own schedules and I think along about how the purchasing department should function (R7) - Assembly of course 100% make/create. And in my case, yes, support as well. But I also have the preparatory (R8)	Quality of organization
specialization of operational tasks	Average	- Especially the customer-specific question pieces that is what I handle (R1) - The same applies to orders from foreign dealers that land on my plate. So that sales actually just skips (R4) - We have sales export managers and sales managers for dealers. Within that, we have seven segments. But we don't have one person, for example, working full time at Airport. (R5) - I think that respondent 1 is actually one of the only ones who works in a customer-	Quality of organization and work

		specific way. The rest just work on the machine generation (R6) - there are 3 working in the line and 6 working outside the line. Yes and those three in the line are also running the line (R8)	
differentiation of regulatory tasks into parts	low	- Yes, I am involved in the whole project, from A to Z. But that's how it should be. (R2) - I have to do all three, yes. I must continue to assess my own process. A bit of a supervisory role and I actually organise my own planning, my own tasks (R4) - Yes, in Movexx you always wear that hat as a manager at some point (R3) - You also have a role in the process of assessing and monitoring, in any case providing documents, so that they can assess (R6)	Quality of work and working relations
differentiation of regulatory tasks into aspects	high	- formation of strategy not really. strategic level not really (R4) - I delegate most of the time and I am therefore only in the role of critic. Yes, and the formation of the strategy is also something that I am involved in. (R3) - The people in the management team or the project leader will make the decisions. (R5) - Yes, the project owner and the MT make the decisions. One person of each department is involved in the MT. (R6) - From the MT's point of view, it is the controlling and also the feedback part that is important. (R8)	Quality of work and working relations
specialization of regulatory activities	low	- I can act reasonably autonomously (R1) - I must check that everything is complete (R4)	Quality of work and working relations
Separation of regulatory and operational activities	average	- I can act reasonably autonomously (R1) - I do have a say in the operational and regulatory activities (R8)	Quality of work
separation per control function	average	- just by being the spider in the web and actually shortening those lines by quick reaction (R4)	Quality of work

| Appendix 7: Summary analysis MIOS functions

MIOS function	Present: Formal/informal	Degree of functioning: good/sufficient/ reasonable/insufficient	Quotes
V1	Formal	Reasonable	- Because of Elfsquad, more and more targeted at CtO (R1) - I get fewer more difficult issues and the stock is getting more and better (R1) - More structures added to the engineering department with more guidelines (R1) - We just said if it is a standard product, so we can configure it, then we know approximately the delivery time. That is often 5 to 6 weeks for a T1000. (R2) - If you really want to have something customer-specific, we have to book engineering time. In the past we could always do that in parallel, but we are too busy for that now. (R2) - Primary process of Movexx they are mainly involved in the issue of handling. (R3) - Because I also want to get involved as little as possible in the primary process. Because otherwise I'm just too busy with that. (R3) - Well at the moment a customer can still get a very large part of customer specific. If he finds the right sales engineer, we sometimes go very far. (R3) - It would otherwise have been much more stressful if there was a lot more engineer to order. (R4) - So we want to make sure that the different parts are universally interchangeable. (R5) - So if you have modularity you only have to sell a certain number of components. (R5) - The hooks will always be like that. But in my opinion, I think that the customer is especially focused on direct business in the Netherlands. (R5) - What we had more last year than now is that people come in from Sales and they say: oh can you make this or that. Or do you have an idea about that. And we are now trying to streamline that more so that it first arrives via respondent 3. (R6) - The last 30 cm of the hook is specific, really the coupling mechanism, but that is exactly what sets you apart from the rest. (R7) - But then I have to say that the entire customer-specific aspect has been kept outside that objective, so it is actually about the general flow of machines. (R7) - So basically you already have all your thinking in that program, so you don't have time to spend on that anymore, because everything in it is correct and then you can focus on the innovative and customer-specific part. (R7) - Late deliveries were customer specific deliveries (R8)

			- We sell the solutions (R8)
V2	Informal	Sufficient	- Supply of sales could be better, so that no feedback is needed every time. (R1) - Cross-pollination in innovation is so incredibly important. That is also a piece of knowledge/certain insight and you can't just capture that, but it has to be translated to the customer. (R2) - An engineering meeting in which you go a little deeper into the agenda and can dwell a little longer on different topics. (R3) - Engineers are also always linked to each other in the sense that they check each other's work. (R4) - The question is more than, do you want to do that project as an organization? Because it often also costs a lot of energy, is the market big enough to invest time and money in it. As has now been done with those new bed movers, so to speak. (R6) - Yes it is extensively tested. So that would be according to the test procedure, that machine will be tested and then they will just check whether it meets the plan of requirements. (R7) - Now you can, so to speak, walk in to someone from sales at assembly and ask; Could you put that thing together, because I need a demo in a minute. Well, that's exactly what happens in engineering. (R7) - So we are not imposing everything from above (R8)
V3	Informal	Sufficient	- Because of the customer-specific design, I do belong to the project. (R1) - So I have noises from the direct customers. And then I need an engineer who will shape that. And then you go into a trajectory. (R2) - But, really steering on the innovation itself? No, not so much. (R4) - We are in the process of implementing shop floor where they can report comments regarding work instructions, etc. At the moment that is still happening with a piece of paper. (R5) - I think both sales, in consultation with engineering. Those two. And I think sales will largely have a claim in that. (R7)
V4	Formal	Good	- Impulsive sometimes the best solution, but mostly it will come from the customer. (R1) - I tell you what happens in the market. I am the eyes of the company and that is what you communicate, we communicate that every Monday. (R2) - I visit companies and I see how such a machine works at the customer. I know what is going well, I know what could be improved. Wherever there is room for improvement. And that is often what I photograph. And I take that back to engineering. (R2)

			- If the market is very large, it is very interesting to look at. Okay, we can run a project for that. (R6) - Mainly from the customer. But I know, for example, that our field service in the Netherlands is very involved, also with the machines they sell. They get the feedback. Machine runs well machine does not run well. That kind of feedback and they bring it back inside the company. (R7) - We sometimes miss some input from the user side (R6)
I1	Informal	Reasonable	- I see innovation as project-based (R1) - Machine succeeded, then it will be in Elfsquad. But how it will be released is not clear (R1) - Testing the machine internally and at 2 or 3 customers. (R1) - Different per project. Be sure that a project can run smoothly. Then we can also sell it abroad. (R2) - When an engineer says; I have an update for a machine or if I see possibilities with that machine, that can also be the start of an innovation. (R5) - Respondent 1 does the customer-specific projects, I just really do more long-term projects. (R6) - In my view it is always innovative. (R8) - Where we need to go is that you make someone responsible for a project or maybe hire independent all round project leaders (R9)
I2	Formal	Reasonable	- Nowadays, projects are being putted into formats with requirements associated with it. (R1) - 1 or 2 radical projects per person in engineering. (R1) - A Project team is mostly with 1 engineer, 1 sales person, 1 purchaser and 1 operator. (R1) - But we do look at when we enter an engineering process to really make/develop something dedicated for the customer. (R2) - Within Movexx, the project management piece is not been developed yet. (R3) - Now it goes, suppose we are going to do a new development. So those are all different phases. Typically at the end of a phase you have one milestone. And in that milestone you want to ensure that, for example, sales or Iris are included in the designs that we have done up to that point. (R3) - Suppose we develop a new machine, we just know okay, we want to target those customers and that segment, we want to make a kind of machine like that and these machines are there already in the market. (R7) - It is often 1 or 2 engineers who take care of it, then purchasing is automatically added and there is also a bit of assembly involved. Well a

			service coordinator can also come in to shine his light over it. (R8) - Often there is someone from every department who is involved in the project (R9)
I3	Informal	Reasonable	- Yes, nowadays we think a little better about that before we start a trajectory. (R2) - Yes, actually the way in which the projects are approached is not fixed. So it's just who gets it. (R3) - Yes custom hooks and such simple things yes. Bigger projects no, not really. (R4) - You have to be project-oriented twofold. On the one hand, you have to take an innovation on a project basis. The other side you have to give people the freedom to do innovation without a project. (R5) - Only problem is sometimes the translation to the concrete time or size. That time or size you can split it. the big into small parts, so we sometimes struggle with that. (R5) - Actually towards the end of the year we do the releases of the existing machines, or the improvements so to speak. So we're working on that halfway through the year. (R6) - A business case is made. And that is where the program of requirements comes in. (R8) - But I do think we'd better finish something before moving on to the next project (R9)
I4	Formal	Sufficient	- A focus has been put in the Bedmovers, and this demand came from the market (R1) - With new machines you have to look at what the competitor has done. Sometimes machines are purchased from the competitor. (R1) - Sales often carries out this, but engineering is watching. (R1) - If there is a lot of need or requests for something specific that we don't have yet. We try to find comparable companies. They actually have a similar situation. That can be a situation, but it can also simply be a new type of cart. (R2) - First we look, within the framework of that customer, whether there is potential in the market. (R5) - The Netherlands is the development playground for the rest of the world. (R5) - Often within Netherlands, because the sellers in the Netherlands think a bit broader, say in terms of solutions, than the dealers do. (R6) - We thought we were smarter but we were not, we missed the boat. In doing so, we sometimes gave too much priority to customer-specific questions, as a result of which we did not complete the Bedmover project (R9)
C1	Informal	insufficient	- Trouble with tracking down knowledge. The Knowledge is in people's heads not in a system. (R1) - No program for previously used innovations. Especially useful for sales (R1)

			- Reasonable open culture. Once every month an employee meeting. (R1) - I do not get any feedback from customers. Sales does say; no hearing is good hearing (R1) - Furthermore, what I do run into is that practical knowledge and engineering knowledge often develop things that I have seen before. - It is not captured and it is not somewhere that tells us; we have already done or tested that. Then comes the knowledge of the people who have a little more experience, who then have to be a bit smart about it. (R2) - Properly stored and all of that will be stored in what we call a technical file. (R3) - ISO is also something of a customer satisfaction survey like something you do 1 or 2 times a year. (R3) - Indeed, to be able to click on a total overview yourself that would be nice. (R4) - Now working on getting ISO, so We're moving a lot more towards procedures and also recording. (R5) - It will no doubt be documented somewhere. Only the visibility of those documents there may still be a problem. (R5) - browse through those folders and look how did they come up with this. (R6) - Yes, actually from the user side. Are they happy with the machines how they work? Do they think that our machines meet their expectations in terms of quality? More like that. (R6) - Would like to know the status of each machine. (R6) - Yes the server, so they have a certain folder on the server where Yes, we call it attaching Strategic Projects or innovation projects and underneath that hang whole structures with where all information is deployed and shared. (R7) - We really have to capture our processes and projects. (R8)
C2	Formal	Sufficient	- The meandering with sales that still has to get out (R1) - Now a month later and still nothing has happened with the 3 test dealers for Elfsquad (R1) - Every Monday we always have a moment that we all put our heads together and that we tell what is happening at the moment. What's going on. (R2) - Thorough planning and a break down structure. (R3) - We have actually come from a phase where the whole company is continuously running in all directions. But now it is important to make choices. (R3)

			- So what we've built now is a whole resource planning. So it contains all the projects that we are currently going to do. If it is not there, we will in principle not do the project. (R3) - Each phase we do a review (R3) - I have the feeling that every now and then sales have the upper hand. (R4) - I have to make the business case and that is usually the guideline for a project. (R5) - Staff meeting the progress and business is discussed. (R6) - MT meets once a month and once every three months the supported functions are also included. (R7)
C3	Formal	Sufficient	- 1 engineer who arranges it and the rest comes with feedback. (R1) - If my project is stopped, I will simply get another project. (R1) - Improvement, what is good is quickly forgotten, and what can be improved is often good focus. (R2) - What I think is the strength of Movexx is that we all know exactly where we stand. (R2) - Decision-making, then that is often decided in those project groups themselves. (R3) - Also the product roadmap, what will you develop over time, that was actually done a bit on the back of the cigar box (R3) - Only that one is well stated by Iris, well, first do a good business case because otherwise we won't start at all. (R3) - Management makes the decisions. Yes unless it is of less relevance. (R4) - Every quarter you have an update with long-term goals, every month a staff meeting. (R5) - We have milestones and that depends on the type of project, so you can't say, one time it's 6, but the other time it's 10 or only two. (R5) - It is run from engineering, because we don't have a project manager. We are doing our own project management. (R6) - Iris yes, she is mainly responsible. (R7) - The small improvement are carried out during work, not really a project team is set up. The PRG group handles that and directs it. (R7) - you will be informed about this and then the decision can be made. Okay, we're going to implement it right away, because it's a small action, or we decide we park it, we collect In the machine update that takes place at the end of the year and you have those two things. (R7)
C4	Informal	Reasonable	- MT is looking at what they want in the future. They meet every 3 months to determine the goals for the 3 months. (R1) - Yes, of course I know what the mission and vision are that we are putting our shoulders to. And sometimes I do play a part in that. (R2) - MT goes in a certain direction and also controls it. (R3)

			- Equal roles in MT, CEO an advantage. (R3) - If necessary, yes I can. But that will always be done in close consultation with the MT and I have to make it clear enough why I would like to pause or stop something. (R3) - Yes, these are quarterly targets. They are refreshed and monitored every quarter and a yes is given. (R4) - During the quarterly meetings, then we go a little deeper into certain projects. (R5) - We are in the middle of the strategic sessions. We have set up a 15 year plan. (R5) - Strategic level I think it's just more up to MT. (R6) - That clarity, that structure, that is now being put in place and I think that is a very good step. (R7) - We will work with ISO in the future. (R8) - If I ask a colleague to name the mission, vision and targets at this moment, I do not really get a clear answer (R3)
Continu-ous improve-ment	Formal	Sufficient	- I think sales have a hard time getting information away from dealers or customers. And perhaps there should be a better overview, we are now thinking about it ourselves. To have a clear overview of what information you need for the engineering process. (R1) - My part the customer specific must be continuous. (R1) - So I think we should pull that out and make sure we hire someone for that on a project basis. Because he or she can then do that kind of work again and we will of course advise that person. (R3) - Improve entire portfolio once a year. (R3) - Yes, if there was an update, we immediately implemented it, but we actually want to go to 1X in the year that you really take all potential improvements in one go. (R5) - fill in a form. Okay, yes, at machine I want to see this product because, modified because? And then you explain the results in these improvements. You send it to the PRG group. We then see that form, we see that application and then it is ok, is it useful for now, yes or no? (R7) - Yes, and we just need to coordinate it better. For example, instead of having multiple lengths of a product, go to one size. That's just making uniformity. (R8)

| Appendix 8: Summary analysis innovative ability

Innovative ability	Quotes
Degree of exploitation	- We are still innovative enough for the incremental innovations because we always get the objectives that we have to achieve. (R1) - But also for the small problems we are helpful for the customer too. You ask, we run and you will notice that. (R4) - The machine updates every October so that we are ready in November so that we can message the dealers. And the updates are mainly about the construction of new machines (R7) - Coming up with really new things, that doesn't happen much. it is more improving the quality and lowering the cost (R6) - I think it's 60% product through development and 40% more radical innovations (R3) - Within the sales department it is incremental, although I do have a person who sometimes thinks completely differently and sees possibilities (R5) - My father used to do it like this when he saw something he developed it and then he moved on to the next product (R9)
Degree of exploration	- In improving customer-specific hooks, there have been real improvements in the last 2 to 3 years, but I actually see that more as radical. (R1) - You do notice that the customer-specific part is an advantage of Movexx. Because other companies may not be able to realize it and movexx can. (R1) - That depends a bit on, like for example a new module or a new machine. There is quite a lot of attention for that, often because it arises from a question (R4) - Both, we see opportunities that we think we have to develop something for. But there are also certain questions from the customer. (R2) - Applying existing technology for a new customer or in a new application. Yes, that is not necessarily the same as the quality. It's really just a new machine (R6) - ISO is a radicale project at the moment for improving the processes (R6) - A radical project is of course a new solution, so a new machine. (R8) - The political answer is that I think I am too little concerned with radical innovations. As a product developer and as an OEM you always try to think steps ahead compared to your competition. Which by definition means that you have to keep producing new products (R3)
Creativity level	- I do not think that the innovation of this company has been removed with the new CtO structure. In any case, I do have the right programs and knowledge to be able to be innovative. (R1) - What they are currently working on is that means of a bonus system. Each department is given certain objectives, but they are also drawn up by the department itself or the adjacent department. (R4) - Yes innovative within my own processes but otherwise no (R4) - Movexx is very dedicated towards projects. Innovation in the DNA of the company and the organization (R2) - I am happy that I can be innovative here. I still think the execution is on the slow side. I have the feeling that the bigger we are, the more difficult it becomes to achieve a certain goal (R2) - That innovation is of paramount importance and that you are simply an innovative club. But the bigger you are, the less loose you will become. (R2) - Yes, that's pretty vulgar here, it's a bit approachable. Everyone walks in by everyone. So yes, there are very short lines. (R7) - Overall, I'm not satisfied with my own role. And that's really just because I have to hold multiple positions. So hats off and on. That's why I don't have enough time to just do everything right. (R8) - Innovative is not just configured. It is in our DNA from the past. But because of the past, we also have some catching up to do to do well for the future. (R8) - Where we need to go is maybe with one or two talented people from the organization. Well, if I'm talking about innovation systems, what I believe in is a kind of budget/rhenium architects. So where you have a few people who can think freely together, a kind of think tank, about the innovative products of the day after

	tomorrow. So not tomorrow but really the day after tomorrow figuratively speaking. (R3) - We have to be careful that we don't get around a bureaucratic shell that could lead to delays, but so far I only see the right things. Innovating also means daring to focus, so also daring to say no. (R5) - extra people needed in the field of engineers (R3)
Type of renewal	- Didn't really experience that something couldn't be done. I am fairly free to do new things (R1) - I think you can gain a lot here at Movexx mainly on innovation within the processes (R4) - Working on looking at what steps can we slowly but surely cut out of the process in order to automate steps that most certainly (R4) - Especially project-based that we actually manage everything within movexx in a project-based way. (R7) - Certainly in the process area it could be better. Well, we'll emphasize that here too. Hence the ISO (R7) - In the normal production process there is no innovation in my idea. (R6) - That is innovation for us, but at market level that is not innovation (R6) - I would really like to see that we really just have real innovations, so not improve the bit. No, just really new. we have those from the past, but I would really just like to see a whole new bed mover, for example. (R8) - We have ideas, but then we just don't get around to them. Sometimes not enough time (R2) - So I think you are working on that piece of work which is actually your main goal; lowering product development disrupted. So that the primary process of assembly can continue and be helped with this (R2) - We could innovate Better and faster. (R5) - I think at the moment they are working around 60 70% on projects (R5) - Group and organizational I think we have the right people at the moment. So that we have created the frameworks to really give innovations passage that we can also do it in a structured way (R5)