ROTTERDAM SCHOOL OF MANAGEMENT
ERASMUS UNIVERSITY

Master Thesis

Business model innovation: How the entrepreneurial manager overcomes the burden of capital intensity

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For graduation at the part-time executive master of science in business administration at the Rotterdam School of Management (RSM), Erasmus University this master thesis is made.

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The author would like to express his gratitude to the supervisor and co-reader.

*"On the other hand, even firms with substantial financial resources but indifferent managerial resources can escape trouble **only** if their entrepreneurs are sufficiently flexible and imaginative to know the kind of management needed by the firm and to attract it."* – Edith Penrose in The Theory of the growth of the firm (1995, p. 38)

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1 Summary

The last decade has been challenging for many established firms. The oil crisis, the financial crisis and the continuously increasing innovations on information management challenge firms to think different about their business. The environment in which firms perform their business becomes more competitive and more dynamic. In particular established, capital intensive firms face the problem of not being able to change their business model. This thesis explains how established, capital intensive firms innovate their business model over time and acquire a competitive advantage by doing so. In particular the resource based view of the firm plays an important role in this research since it explains some of the barriers and biases management of these firms encounter when trying to renew the business model.

Based on literature review, three propositions are developed to answer the central research question. Research was conducted in the maritime industry of Europe. Three cases studies were conducted, which include interviews with top management of these firms. The firms and their business model innovation trajectories are analysed. The conclusion is that all firms within this research innovate their business model customer-driven for a certain period in time. Management of established, capital intensive firms, is reluctant to use the lever of technology if there are uncertain, long term rewards. They mainly innovate their technology driven by customer, often with co-creation. But when the competitive advantage weakens, firms strategically renew their organization and management to assure a competitive advantage. Implications for management include ways to promote business model renewal. In particular the entrepreneurial role of top- and middle management is addressed.

1.1 Keywords

Penrose, entrepreneur, management, technology, organization, co-creation, business model innovation, business model transformation, capital intensity, resource based view, demanding customer, existing customer, strategy, growth of the firm, decline of demand.

2 Introduction

Last decade the financial crisis and ongoing 3th industrial revolution on information and communications technology challenges firms to think radically different about the future of their business. The business of ten years ago is already very different from business nowadays (Kaeser, 2018). To fundamentally change an established firm is a near impossible venture (Amit & Zott, 2015; Volberda et al., 2017, p. 107). Yet recent circumstances request these dramatic changes in the way these firms do their business. The economic crisis in 2009 and the low oil prices of today forced firms to close down or reduce their business dramatically. Established capital intensive firms like Thermphos, Tata Steel, IHC, Damen Shipyards and Heerema needed to dramatically reduce or close down their business due to heavy changes in demand. Niche yacht builders like Feadship and AMELS Holland on the other hand, saw strong fluctuations in demand of over 20%.

Strong fluctuation in demand requires firms to grow and shrink with these fluctuations and potentially harm the continuity of the knowledge base. The capability to absorb these fluctuations in demand is a strong competitive advantage, since the firm will be able to sustain their knowledge base and continuously improve their business. Penrose (1995) describes however that *"Having acquired resources for actual and contemplated operations, a firm has an incentive to use as profitably as possible the services obtainable from each unit of each type of resource acquired."* (p.67). If this resource is a highly capitalized asset, a machine shop for instance, then it becomes very hard to use these assets as productive as possible if there are high fluctuations in demand. Thus in particular capital intensive, established firms have the problem of not being able to fundamentally change their business (Amit & Zott, 2015; Volberda et al., 2017, p. 107). Yet, some firms are able to deal with this new reality on asset utilization: these firms change their business model.

A business model is a fairly new unit of analysis in business strategy literature (Zott, Amit, & Massa, 2011). A business model describes how a firm performs its business (Hamel, 2000) and *"sets out the competitive strategy by which larger or new competitive advantages are achieved"* (Volberda et al., 2017, p. 28). Management of firms have four levers at their disposal to innovate their business model: technology, management itself, organization and co-creation (Volberda et al., 2017). Scholars describe that current literature on business model innovation should be addressed carefully in the context of established, capital intensive firms since little research was conducted within this specific context. Amit & Zott (2015, p. 347) explain that: *"Such firms face strong internal constraints (e.g., established asset structures and business relationships) that may warrant specific theoretical consideration and require the modification of some of our propositions or the development of new ones."*

This thesis fills this gap by answering the question: **"How does management of established, capital intensive firms, in an industry that experiences strong fluctuations in demand, use the four levers of business model innovation over time in order to influence competitive advantage?"**

Besides the levers that management can use to change the business model, in particular the role of management itself is addressed since Penrose (1995) describes that: *"the capacities of the existing managerial personnel of the firm necessarily set a limit to the expansion of that firm in any given period of time, for it is self-evident that such management cannot be hired in the market-place."(p. 46),* thus claiming that management itself is the main limitation to the growth of a firm.

First a literature review on business model innovation is made. From the literature review, three propositions and the corresponding framework is developed. Then three case studies follow which were held in the Dutch manufacturing and maritime industry. For these case studies interviews were conducted with top management of these firms in order to better understand the rationale of their business model innovation. A within case and cross case analysis is made, where after conclusion, implications for management and limitations follow.

This thesis will contribute to theory in threefold. First it will show how firms that are limited by their fixed assets, deal with high fluctuations in demand and innovate their business model to achieve a competitive advantage. Secondly, building on Penrose(1995) this research will contribute to theory what the role of management is in innovating the business model of established capital intensive firms during growth and decline of demand. And third, since business models are a fairly new unit of analysis (Zott et al., 2011) this research will help to further understand the concept of business models and business model innovation in the context of established, capital intensive firms.

3 Literature review, propositions and framework

In the following chapter a literature review will be conducted which will describe what business models are, which components are part of a business model, how value is created and appropriated by a business model and how business models add to competitive advantage. The concept of business models will be described with reference to three grand theories, being the resource based view of the firm, transaction cost theories and dynamic capabilities. Since this thesis is about high capitalization of firms and their limits to business model innovation, a specific paragraph on the resource based view on the firm and its implications for business model innovation is given. The review continues with business model innovation and the four levers management can use to change the firms business model. The review ends with the conceptual framework and three propositions based on the literature.

3.1 Business model

A business model is a fairly new unit of analysis in business strategy literature (Zott et al., 2011). Academic publications on business models started around 1995. Since then various definitions of the business model concept were introduced by different scholars. For instance *"a reflection of the firm realized strategy"* (Casadesus-Masanell & Enric Ricart, 2010, p. 195) or *"stories that explain how enterprises work"*(Magretta, 2002). This makes the idea of a business model confusing and research on business models difficult. Definitions of business models are not always in line with each other. Some focus more on a holistic, abstract definition (Chesbrough & Rosenbloom, 2002) , while other scholars try to define concrete components of a business model (Johnson, Christensen, & Kagermann, 2008), which increases the relevance of business models for science and management (Zott et al., 2011). Almost all scholars however define a business model as a template, architecture, description or network that describes how a firm performs business and makes profit by doing so. For instance Zott & Amit (2010) define a business model as:

"the system of interdependent activities performed by a focal firm and its partners and the mechanisms that link these activities to each other." (p. 216)

And Teece (2010) defines a business model as:

"A business model articulates the logic, the data and other evidence that support a value proposition for the customer, and a viable structure of revenues and costs for the enterprise delivering that value" (p. 173)

Both definitions clearly describe that a business model is more than a business strategy or a value proposition. Business models describe in what way firms do business and how they deploy their resources and deliver products to their customers. Volberda, van den Bosch and Heij (2017) describe three main elements in a business model, being:

1. The components and their relationship
2. Value creation and appropriation
3. Contribution to competitive strategy

Firms can use different business models for different products and different customers.

3.1.1 Components of a business model

Since scholars provide different definitions for a business model, the underlying components of a business model are also different. One of the best known descriptions of business model components is the "Business Model Canvas" developed by Osterwalder & Pigneur (2010). The main components of the canvas are customer segments, value proposition, channels, customer relationships, revenue streams, key resources, key activities, key partnerships and cost structure. The research of Zott, Amit & Massa (2011, p. 1027, table 2) describes an extensive literature review on all components of a business model. These components however apply to developments in e-Commerce. A comparison of these components with research of other scholars (Johnson et al., 2008; Osterwalder & Pigneur, 2010; Teece, 2010) shows that the main stream of business model literature is line with Johnson et al.(2008) and shows further that the concept of a business model is not bounded by e-commerce, but has a broad field of application.

Johnson et al.(2008) mention four main components as part of a business model, being the customer value proposition (CVP), profit formula, key resources and key processes. These components are compared with components mentioned in the works of Teece (2010), Osterwalder & Pigneur (2010), Mahadevan (2000), Stewart & Zhao (2000), Afuah & Tuci (2001), Alt & Zimmerman (2001), Applegate (2000), Rappa (2001), Osterwalder (2004), Bonacorssi et al. (2006) and Brousseau & Pénard (2007). Most of the components mentioned are in line with the work of Johnson et al.(2008), some mentioned components however are not. Stewart & Zhao(2000) *"strategic contro*l", Afuah & Tucci (2001) *"implementation",* Alt & Zimmerman(2001) *"Goals, vision, mission",* Apllegate (2000) *"strategic"* appear to have a vision which is more in line with business strategy. Teece (2010) *"adapted to competitive environment"*, Afuah & Tucci (2001) *"sustainability",* Applegate (2000) *"competitive dynamic",* Bonaccorsi, Giannangeli, & Rossi(2006) *"network externalities",* Brousseau & Penard (2007) *"Network externalities"* and *"sustainable income generation"* take note of the competitive environment firms encounter. Alt & Zimmermann(2001) also add legal issues as a component of a business model. Although both strategy and the competitive environment are important, Volberda, van den Bosch and Heij (2017) separate the components of a business model from the strategic implications and how value can be created. They summarize that the core of a business model is its operational model, describing *"how key resources, capabilities, activities, processes and their interdependencies, ranging from a firm's input through to its output, are deployed in order to realize operational and process advantages."* (Volberda et al., 2017, p. 26).

3.1.2 Value creation and appropriation

Value creation and appropriation is the second common subject in business model literature. A business model describes how value is created for the customer and in how the focal firm appropriates a part of this value creation. Important to mention is that a business model thus describes how value is created in the total supply chain and what role the focal firm plays in this value creation. Chesbrough (2007) explains that "*This is crucial, because if there is no net creation of value, the other companies involved in the set of activities won't participate."* This confirms that a business model is a more holistic view on doing business. The economic model of the business model is the core element of value creation and appropriation. The economic model can be divided into two parts: the cost structure and the revenue structure (Baden-Fuller & Haefliger, 2013). A firm has to decide who shall pay for the delivered value and how often. Here some generic examples are defined

in literature. Well known examples of costs and revenue structures are the razor blade model, freemium model and direct selling (Teece, 2010).

The razor blade model describes how a firm can sell the basic good at a relative low price, but adding extra mark-up to the consumables it uses. Excellent examples are Gillette, Senseo, consumer printing and Polaroid. These companies do not necessarily make a profit on the razor, coffee machine or printer, but they do make a lot of profit on the blade, pad and printing cartridge. They can only do so if they can assure some sort of lock-in mechanism that prevent customers from using cheaper, no-brand consumables (Teece, 2010; Volberda et al., 2017).

The freemium model is a more recent model of costs and revenue structure. It describes how firms can decide not to charge for value delivered. This model has been described by Fred Wilson as: *"Give your service away for free, possibly ad supported but maybe not, acquire a lot of customers very efficiently through word of mouth, referral networks, organic search marketing, etc., then offer premium priced value added services or an enhanced version of your service to your customer base."* (Teece, 2010, p. 178) The freemium model is a well know model in e-commerce and can be used to acquire a large base of users that eventually will pay for an enhanced version. It is even possible to not charge the direct user, but acquire revenues via a secondary channel (Weiblen & Chesbrough, 2015, pp. 78-80). Examples of this model are the Google Android System and SAP HANA.

Direct selling is a cost and revenue structure where the firm sells only direct to consumers and does not have reselling partners and distribution channels. This model cuts out the intermediary and makes it possible for firms to have a more direct relationship with the end-users of their products. Examples can be found in the e-commerce (Dell) and airliners (Southwest) where the classic travel agencies are near to non-existing compared to a decade ago.

Baden-Fuller & Haefliger (2013) introduce a hybrid business model, which is a model that generate revenues from multiple customers, such as the newspaper model which generates revenues from readers and advertisers. Google Adwords is also a good example of a hybrid business model. Value is created for both user and advertiser, while revenues are generated only by the advertisers.

Chesbrough (2010) articulates that *"if others, outside the firm, uncover a business model more suited for a given technology, they may realize far more value from it than the firm that originally discovered the technology."* stressing the importance for the focal firm of capturing the right value for the value created. If a firm fails to capture the right value, it will generate not enough revenue and will potentially lose money. On the other hand, if a firm captures too much of the value created, both consumers and suppliers might leave. Both are a threat to the firms future.

3.1.3 Contribution to competitive strategy

Scholars describe the importance of linking the business model with the firms' strategy. Some argue that the business model is a result of the chosen strategy (Casadesus-Masanell & Enric Ricart, 2010; DaSilva & Trkman, 2014), linking the business model to strategy by the actions taken in time. Others describe a business model as part of a strategy. Casadesus-Masanell & Ricart (2011) explain that all firms have a business model, but not all have a strategy: *"Strategy refers to the contingent plan about which business model to use."*(Casadesus-Masanell & Ricart, 2011, p. 107).

A business model on itself does not lead to competitive advantage and needs a strategy before implementation. Business models are often rather transparent and therefore easy to copy. A good business model is hard to imitate and differentiate the focal firm of its competitors (Teece, 2010). Amit & Zott (2001) in their research in e-business, describe that there are four sources of value creation in a business model that can distinguish one firm from the other. These sources are: efficiency, novelty, lock-in and complementarities.

Obviously, if a business model does not lead to a, at least temporarily, competitive advantage, the model has no value. Since firms do not operate in a vacuum, the reaction of competitors should be carefully assessed before implementing a new business model (Casadesus-Masanell & Ricart, 2011; Volberda et al., 2017).

3.1.4 Theoretical Grounding of the business model concept

Many scholars acknowledge that academic literature on the business model concept lacks focus and is highly fragmented (DaSilva & Trkman, 2014; Teece, 2010; Volberda et al., 2017; Zott et al., 2011). The problem for theoretical grounding of the business model concept is exactly the reason of its importance: the business model concept is an interdisciplinary topic which takes into account the imperfections in factor and product market mechanisms. The business model concept emerges where the individual social, economic and business studies end (DaSilva & Trkman, 2014; Teece, 2010).

Teece (2010) explains the importance of the business model with very strong examples of companies providing the same product in a different and therefore successful way. Teece analyses the 19th century meat industry and the changes "Swift and Company" made to their business model by transporting frozen meat instead of livestock. He continues with the example of the invention of containerized transport by Sea-Land and the business models of Netflix and Easy Jet. He concludes that all companies, explicitly or implicitly, have a business model and that the concept of a business model is connected with economic theory, innovation management and business strategy.

DaSilva & Trkman (2014) analyse the business model concept through different perspectives in established theories, trying to distinct it from the former. They conclude that the business model concept *"paints a picture of the company and reveals how the various elements of the business work together at a certain moment in time." (DaSilva & Trkman, 2014, p. 286).* They further conclude that a firms' strategy, dynamic capabilities and the business model are related to each other. Management should use strategy and the dynamic capabilities of a firm to change the business model. In order to gain sustained competitive advantage, management should:

- Acquire the right combination of resources, linking business models to the resource based view of the firm.
- Assure the most efficient transactions, linking business models to transaction costs theory
- Adapt resources as required, linking business models to dynamic capabilities

These three points of view provide strong theoretical grounding of the business model concept. Since this research focusses on management of firms constrained by their highly capitalized resources, the theoretical lens will be the resource based view of the firm.

3.1.5 The resource based view of the firm, management and business models

The resource based view of the firm (RBV) is an important academic framework that describes how firms can create and sustain competitive advantage over time by developing specific resources and the services that come from these resources (Barney, 1991; Eisenhardt & Martin, 2000; Penrose, 1995; Peteraf, 1993). Contrary to the strategic positioning literature (Porter, 1979), the RBV focusses on the heterogeneity of resources, which are limited in their mobility. The RBV explains that although firms can produce the same goods and services they can do so with a different set of resources. This typical, focal firm specific, set of resources can become a sustainable competitive advantage if these resources are valuable, rare, imperfect imitable and non-substitutable (Barney, 1991).

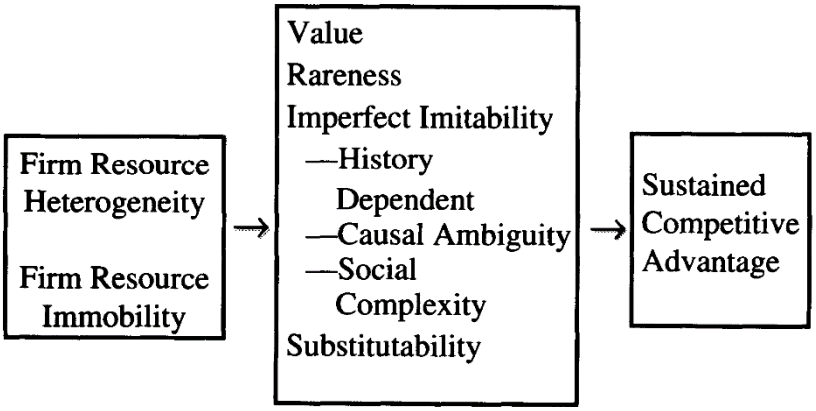


Figure 1 – The relationship between resource immobility and heterogeneity, value, rareness, imperfect imitability and sustainability and competitive advantage, taken over from Barney (1991, p. 112, figure two)

It is not the resource, but the services provided by the resource that makes the value to the firm. Management itself is also considered as a resource and thus provides services to the firm. In the RBV theory, a firm is considered as an administrative entity which *"involves its role as an autonomous administrative planning unit, the activities of which are interrelated and are co-ordinated by policies which are framed in the light of their effect on the enterprise as a whole"(Penrose, 1995, p. 15).* She argues that, since all growth by a firm is planned in some way, there need to be managerial services available before the actual growth is taking place. Clearly making growth a planned action and describing that during growth the surplus on managerial services will diminish, since the established growth itself needs coordination. This "Penrose Effect" has been confirmed in several empirical researches (Hutzschenreuter & Horstkotte, 2013; Peng & Heath, 1996) and since competent firms' specific managers cannot be hired from the market, management itself becomes the main burden for internal growth of a firm.

Penrose (1995) stresses the role of entrepreneurial management within a firm. She describes two types of managers: "the businessman" and "the entrepreneur". Where the businessman lacks the ambition to maximize the opportunities to firm growth and the entrepreneur who "*drive in the same circumstances to expand their operations in an unending search for more profit, and perhaps greater prestige"* (Penrose, 1995, p.35). These two types of management have clear similarities with literature of business model innovation, where business models can be replicated or renewed, and ambidextrous organizations (Jansen, Van den Bosch, & Volberda, 2006) who strive for exploitation of the current business model and exploration for new opportunities.

The lack of entrepreneurial services is not the greatest inhibitor of growth to a firm. Penrose (1995) describes that *"for the most effective restriction on the quality of entrepreneurial services is that which stems from a lack of interest in experimenting with new and alien lines of activity, or in moving into new geographic areas."* (p.35). She explains that the lack of entrepreneurial management can be overcome by hiring the right managers. But if existing management is not willing to do so by the lack of interest, then the firm will run into trouble since a bull market does not sustain forever. Keeping the status quo is therefore not an option for management of these firms. Penrose (1995) describes *"Such conditions do not last indefinitely and the unenterprising firm ceases to expand as this type of opportunity declines"* (p.34). She concludes that *"Thus, the managerial competence of a firm is to a large extent a function of the quality of the entrepreneurial services available to it."* (Penrose, 1996, p.35).

3.2 Business model innovation

Business models describe how a firm, at a given time, uses its resources to delivers its products and services to their customers and how it makes profit by doing so. (DaSilva & Trkman, 2014; Teece, 2010; Zott et al., 2011). Firms can use different business models for different products and customers. Business model innovation occurs whenever one of the components of a business model changes, or when the relationship between the components changes (Amit & Zott, 2012; Johnson et al., 2008; Zott & Amit, 2010).

During growth firms can choose to replicate their business model, build a new business model or develop a dual approach where the firm renews its model while sustaining profitable models. If a firm is only able to replicate their business model and is not able to change their business model, it will lose competitive advantage and lose business on the long run(Johnson et al., 2008). Firms need to be able to re-invent their business model (Chesbrough, 2010) and the capability to do so is considered as a competitive advantage (Bertolini, Duncan, & Waldeck, 2015; Zott et al., 2011).

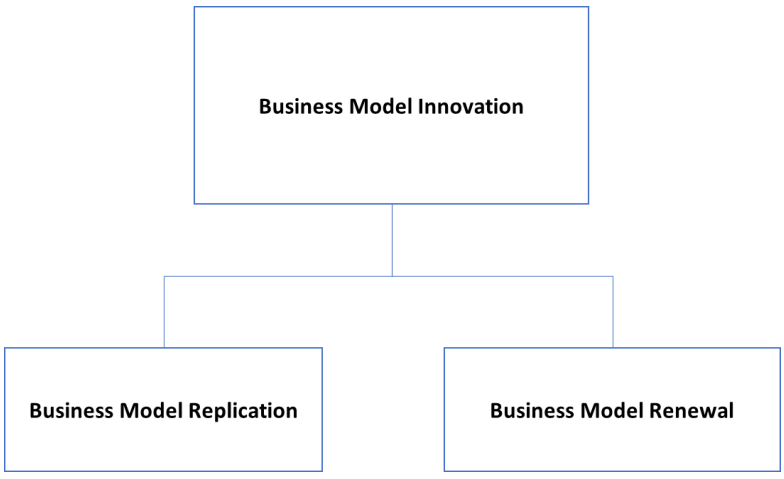


Figure 2- Two Types of Business Model Innovation, taken over from Volberda et al. (2017, p. 24)

3.2.1 Business model replication

Replication is a well-known innovation strategy. Examples can be found in big firms that very successful replicate there business model when entering a new geographical market, for instance McDonalds and IKEA. The strategy of replication is a strategy of determining what components of the business model can be sustained in the new context, and what components should be adjusted slightly to align with customers' needs (Ghemawat, 2003; Johnson et al., 2008; Winter & Szulanski, 2001). For instance: Only changing the product and keeping the rest of the business model the same, is a very simple business model replication. The idea of business model replication is mainly of exploitative of character: it increases firm performance by using the same business model, thus becoming more efficient (Heij, Volberda, & Van Den Bosch, 2014).

Table 1 – Characteristics of business model replication (Volberda et al., 2017, p. 35, table 2.2)

Aim	• Maintain or improve existing competitive position
Focus	• *Improving current methods* of value creation through incremental innovation of the existing business model
Levers of change	• *Perfecting and deepening existing* technologies, management practices, organizational forms and customer relations.
Business model components	• Refining *current* business model components
Business model complementarities	• Strengthening complementarities between *current business model* components
Outcomes	• Remaining active in *existing* markets, or entering similar but geographically different markets
Risks	• Limited risk on the short term • High risks in the longer run

3.2.2 Business model renewal

Business model renewal is a more radical approach to business model innovation. It is the generation or change of a business model that is far reaching and goes beyond the existing components and the relationships between them. Business model renewal includes the development of a complete new business model for the existing firm (Amit & Zott, 2001; Johnson et al., 2008; Osterwalder & Pigneur, 2010).

Business model renewal is closely related to disruptive innovation. Not the innovation itself, but the business model around it can become a strong source of competitive advantage and might even acquire a disproportionally large part of the market. Business model renewal is however not without risks. Since some experimentation is needed, failure is also possible. Firms that endeavour business model renewal therefore need to be able to incur some losses. Well known examples of business model renewal and their disruptive character are Appels' iTunes, iPod and iPhone. Budget airlines in Europe disrupt the market with their innovative business model, while Airbnb disrupts the hotel

market. (Bower & Christensen, 1995; Volberda et al., 2017, p. 30; Zott et al., 2011). Volberda, van den Bosch & Heij (2017) provide the indicators as described in Table 2 to determine if change is renewal.

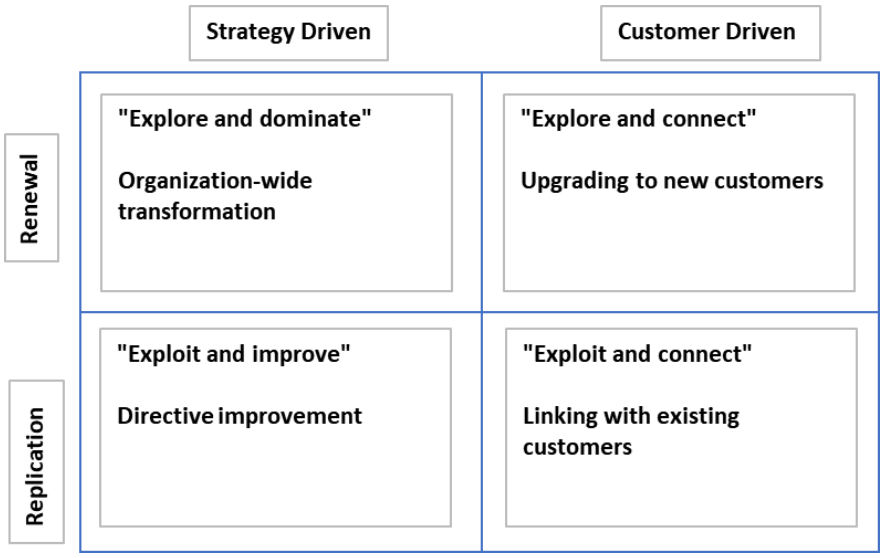
Table 2 – Characteristics of business model renewal (Volberda et al., 2017, p. 33, table 2.1)

Aim	• Reach a new, more sustainable competitive advantage
Focus	• *New* methods of value creation through radical renewal of existing business model
Levers of change	• *New* technology • *New* management practices • *New* organizational forms • *New* relationships with customer: co-creation
Business model components	• Obtain *new* business model components
Business model complementarities	• Obtain *new* complementary effects among business model components
Outcomes	• Aggressive move into existing markets or entering *new* markets
Risks	• Very high risks for first firm in sector • High risks for imitators

3.2.3 Business model transformation

Business model innovation can be internally, strategy driven or externally, customer driven (Volberda et al., 2017, p. 144). Combining these two orientations with renewal and replication, four distinctive combinations can be made. The process of changing between these types of business model innovation is called business model transformation.

Figure 3- Business model innovation matrix, adapted from Volberda et al. (2017, p. 145, figure 6.1)



Volberda, van den Bosch & Heij (2017) distinct six drivers for the four types of business model transformation, being the type of leadership, commitment from management, company culture, orientation of knowledge absorption, environmental dynamism and firm identity orientation, see Table 3.

Table 3 – Six drivers of business model transformation, adapted from Volberda et al.(2017, p. 145, figure 6.1)

	Strategy-driven renewal	**Customer-driven renewal**	**Strategy- driven replication**	**Customer-driven replication**
Type of leadership	Transformational	Transactional	Transformational	Transactional
Commitment	Top and middle management	Top and frontline management	Top management	Top management
Company culture	Innovative	Innovative & Customer-driven	Less innovative	Customer-driven
Knowledge orientation	Internal	External	Internal	External
Environmental Dynamism	Dynamic	Dynamic	Competitive	High competitive
Identity orientation	New internal identity	New external identity	Strong internal identity	Strong external identity

3.3 Initiating business model innovation

Business model innovation is based on four levers which the top management team can use to alter their business models: technology, management itself, organization and co-creation with external parties (Chesbrough, 2007; Itami & Nishino, 2010; Teece, 2010; Volberda et al., 2017). Management can use these four levers individually or in combination with each other. With the use of a combination of levers the top management team can put focus on technology renewal, internal renewal, external renewal or integral renewal.

Table 4 – Lever combinations that have complementary effects on business model innovation, taken over from Volberda et al. (2017, pp. 114, table 4.4)

Technologically oriented renewal	Internally oriented renewal	Externally oriented renewal	Integral renewal
new technologies +	new technologies +	co-creation with customers +	new technologies +
new management practices	new management practices +	new management practices +	co-creation with customers +
	new organizational forms	new organizational forms	new management practices +
			new organizational forms

3.3.1 The lever of technology

In early business model innovation literature, the focus is mainly on technological innovations. Flourishing e-commerce and the unprecedented opportunities increased focus on technological innovations that enabled firms to acquire a competitive advantage (Amit & Zott, 2001; Chesbrough, 2007; Chesbrough & Rosenbloom, 2002). Indeed, when investing in the right technology, firms can achieve – sustained – competitive advantage(Amit & Schoemaker, 1993; Barney, 1991; Penrose, 1995).

Recent studies show that technology can be both a result and a source of business model innovation (Zott et al., 2011, p. 1034). Technology can be a part of the product or services sold and it can be part of the realisation process of these products and services. The industrial revolutions can be considered as waves of technological innovation and business models were changed dramatically during the revolutions.

Technology can also become a burden to business model innovation. Especially high capitalization and strong antecedents appear to have strong influence on the capabilities of firms to change their business model (Amit & Zott, 2015; Volberda et al., 2017, p. 107). These assets act as an inertia to change (Volberda, 2004, p. 90) and become a burden to business model innovation. This is caused by bias of management, who want to maximise revenues on their existing assets (Penrose, 1995, p. 67) and do not want to take risk and experiment with their expensive assets (Chesbrough, 2010, p. 358). These companies might end up in a business model trap (Volberda et al., 2017, p. 12) and become vulnerable for a Schumpeterian shock (Amit & Schoemaker, 1993, p. 39; Joseph A. Schumpeter & Opie, 1934), which potentially ends the firm.

Amit & Zott (2015) explain that: *"Such firms face strong internal constraints (e.g., established asset structures and business relationships) that may warrant specific theoretical consideration and require the modification of some of our propositions or the development of new ones."* (p. 347)

3.3.2 The lever of management

As pointed out by Penrose (1995), management itself can become the main burden to growth in a firm. If a firm operates at maximum efficiency, there will be no managerial services available to manage the growth of a firm. Meaning that either the firm does not grow, or the firm grows less efficient and thus generates less profit per capital employed. The management needed to coordinate this growth will be hired from the market. To get the hired managers up to firms' standards, time is needed. There will thus be no incentive within the top management team to grow. This situation can be maintained for a long time within certain markets and industries. If a firm experiences strong competition and dynamism within the market however, management must initiate activities that enable the firm to sustain these fluctuations (Eisenhardt & Martin, 2000; Volberda, 2004). This involves new management practices.

"Management innovation consists of changing a firm's organizational form, practices and processes in a way that is new to the firm and/or industry, and results in leveraging the firm's technological knowledge base and its performance in terms of innovation, productivity and competitiveness." (Volberda, Van den Bosch, & Heij, 2013, p. 1). A well-known management innovation is the Toyota Production System as developed by the Vice-President of Toyota Motor Company, Mr. Taiichi Ohno. It empowers manufacturing employees to question engineers and management and makes them responsible for their own workshop and environment (Sugimori, Kusunoki, Cho, & Uchikawa, 1977).

Other management innovations can contain specific rule or budget setting by management. For instance Googles 20% rule, which ensures that employees of Google spend 20% of their time on work they are intrinsically interested in, enabling innovation by every employee (Page & Brin, 2004, p.28). The ability to innovate management within a firm is considered as a strong competitive advantage (Vaccaro, Jansen, Van Den Bosch, & Volberda, 2012).

3.3.3 The lever of organization

Organizing is considered as one of the main tasks of management (Fayol, 1917; Penrose, 1995). Firms can use the lever of the organization to initiate business model innovation. The organization can be flexible and rigid and several generic organizational forms exists. All however intend to have the work divided in clear tasks and the way this work can be coordinated (Volberda, 2004, pp. 45 - 47).

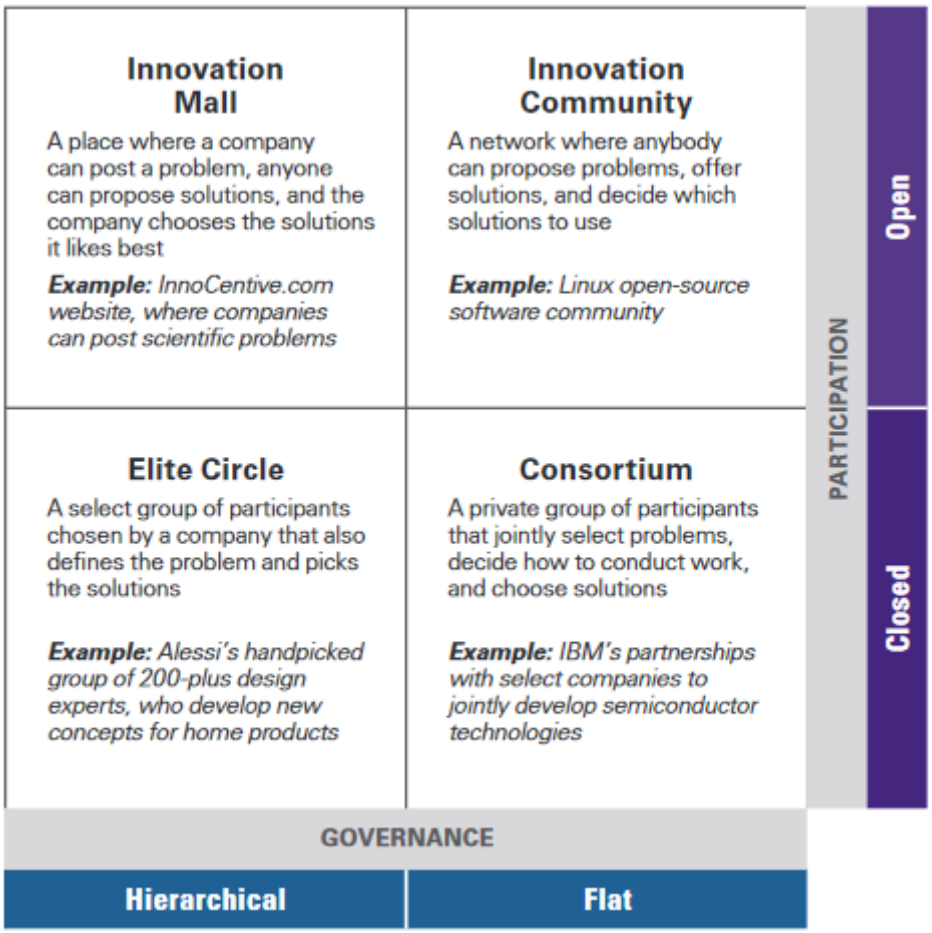
If a manufacturing firm wants to develop services as a business for instance, it needs to change its organization(Foss & Saebi, 2015). Management can also use the organizational lever to initiate or sustain disruptive innovation (Gilbert, Eyring, & Foster, 2012; Govindarajan & Trimble, 2005). Then a hybrid organization is developed which has, next to the old organization, a new business unit that has to develop mechanisms against disruption. In such a hybrid organization it is important to understand what resources will be shared between the two units and what resources will not be shared. IBM successfully used this strategy to enter the market of personal computers. The mainframe culture and organizational antecedents of IBM smothered the option to enter the PC market with the current organization. IBM circumvented this by starting a separate, isolated business unit that would develop an IBM PC and enter the market for personal computing with it. History tells us that they did this very successfully. Later IBM tried to have the skills and capabilities of the PC business unit transferred to the mainframe business unit. This appeared to be very difficult since both business units missed common ground (Volberda et al., 2017).

3.3.4 The lever of co-creation

It will be supply chains, not firms, that will compete each other in the future(Li, Ragu-Nathan, Ragu-Nathan, & Rao, 2006). These supply chains not only provide goods, but also information to firms and consumers. Optimized supply chains will be able to deliver better, cheaper and faster than the competing supply chain. One of the reasons behind this reality is the globalization of markets and the ongoing improvements in communication technology. This enables firms to acquire knowledge from the market instead of developing this knowledge themselves. Consumers and firms nowadays are better informed, more mobile and communicate open about performance of firms and products (Prahalad, 2004). Therefore it will become more and more important for a focal firm to be able to not only co-operate with other firms or consumers, but even co-create.

In some industries co-creation is well embedded. Within consumer electronics and e-commerce business is creating with customers or other parties a well-known strategy (Weiblen & Chesbrough, 2015). How firms can co-create and what governance method gives the best results is described by Pisano & Verganti (2008).

Figure 4 – Four ways to collaborate as taken over from Pisano & Verganti (2008, p. 82)



These four methods provide guidance to firms that want to open-up their innovation process. Obviously not all methods can be applied to every firm or industry immediately. Closely examining the benefits and drawbacks of co-creation will determine in what way a firm can open-up the closed boundaries of the administrative unit and start co-creating.

Chesbrough (2003) defined six contrasting principles of closed and open innovation, which can give early warning signals of a too closed innovative culture, see figure 5.

Figure 5 – Contrasting principles of open innovation, as taken over from Chesbrough (2003, p. 38)

Contrasting Principles of Closed and Open Innovation

Closed Innovation Principles	Open Innovation Principles
The smart people in our field work for us.	Not all of the smart people work for us* so we must find and tap into the knowledge and expertise of bright individuals outside our company.
To profit from R&D, we must discover, develop and ship it ourselves.	External R&D can create significant value; internal R&D is needed to claim some portion of that value.
If we discover it ourselves, we will get it to market first.	We don't have to originate the research in order to profit from it.
If we are the first to commercialize an innovation, we will win.	Building a better business model is better than getting to market first.
If we create the most and best ideas in the industry, we will win.	If we make the best use of internal *and* external ideas, we will win.
We should control our intellectual property (IP) so that our competitors don't profit from our ideas.	We should profit from others' use of our IP, and we should buy others' IP whenever it advances our own business model.

3.4 Enablers and inhibitors of business model innovation

Not every firm is able to use the levers of business model innovation in the same way. This ability can be inhibited but also enabled by certain contextual conditions the firm operates in. These conditions can be external as well as internal ones. In the research of Volberda, van den Bosch & Heij (2017), the five most important enablers of business model innovation are defined, see table 5.

Table 5 – Five most important enablers of business model innovation, derived from Volberda et al. (2017, p. 141, figure 5.3)

- Cultural aspects and type of leadership
- CEO Characteristics
- Level of external orientation
- Organizational characteristics
- Institutional enablers

3.4.1 Cultural aspects and type of leadership

In general, types of leadership can be divided in two: transactional leadership and transformational leadership. Transactional leadership can be considered as an exchange agreement between the leader and the employee. This includes performance based incentives, bonusses or, in a negative way, avoid being punished. Transactional leadership is positively related to employers performance, satisfaction and commitment (Bass, Avolio, Jung, & Berson, 2003, p. 208).

Transformational leadership on the other hand is characterised by four elements (Avolio, 1999):

- Idealized influence
- Inspirational motivation
- Intellectual stimulation
- Individualized consideration

Idealized influence is about admiration, respect and trust of the leader by the employee. Employees identify themselves with their leader and want to become as good as their leader in their work. The leader earns credit by fulfilling the needs of the employees over his own needs.

Inspirational motivation is about providing a challenge and a meaning of the work to do. Individual employees and the team itself is being motivated, optimism and enthusiasm are shown. The leader inspires employees with an attractive future, which they can be part of as well.

Intellectual stimulation is about driving creativity by questioning assumptions and promoting experimentation by not criticising employees that make mistakes. Employees will come up with problems and potential solutions for these problems.

Individualized consideration is about leaders that pay attention to the individual needs to grow in their career. Employees are actively being coached so they become increasingly better, with even more potential.

Volberda, van den Bosch & Heij (2017) found in their research that in particular *transformational leadership* has a positive effect on both renewal and replication of the business model. Interestingly however Vaccaro et al. (2012) found evidence that transactional leadership can have a positive influence on management innovation as well.

A *firms identity* tries to answer the question "Who are we as an organization?"(Brown, Dacin, Pratt, & Whetten, 2006; Kenny, Whittle, & Willmott, 2011). That identity is embedded in the employees norms and believes and expressed through their practices(Hofstede, Neuijen, Ohayv, & Sanders, 1990). Symbols, artefacts, heroes and champions are real life examples of a firms identity. A firm with a strong identity can take advantage of it when replicating their business model (Volberda et al., 2017). The downside of a very strong identity is that it might result in xenophobia and thus results in a strong resistance to business model renewal.

An *innovative culture* can only be acquired when management is flexible in the way they lead the firm. The unpredictable nature of innovations itself implicates that firms need to be flexible enough to incorporate the innovations in its business model (Volberda, 2004). In a firm with a conservative culture there will be little room for change due to a strong peer pressure to obey and work according the rules (Volberda et al., 2017). In their research, Volberda, van den Bosch & Heij (2017, p. 125) conclude that an innovative culture significantly contributes to business model renewal, while having no influence on replication.

To share knowledge across an organization, *internal cooperation* in necessary (Tsai, 2002). Too much internal cooperation may hamper the ability to acquire new knowledge. Too little internal cooperation however, hampers the ability to commercialize on newly acquired external knowledge (Jansen, Van den Bosch, & Volberda, 2005). In particular the role of standardization on processes is important. While standardization of processes does make an organization more effective, it does only so when the environment is stable and innovations occur in incremental way, for existing customers. If a firm ends up in a turbulent environment with new technologies and potential new customers, the standardization process hamper the ability to adapt the business model as needed. Thus making internal cooperation particular important for replication.

3.4.2 CEO Characteristics

CEO's have the challenge to balance the long term orientation with the short term rewards. The willingness to renew has several cognitive barriers which can be summarized as the 'dominant logic'. The unwillingness to cannibalize the current, profitable, business is one of the barriers to change. Also letting go of existing customers, a short term vision, risk aversion and a strong focus on existing rivals may result in a firm that does not renew but only replicates their business model (Tushman, Smith, & Binns, 2011; Volberda et al., 2017, p. 125).

Research shows that *the length of the period a CEO is appointed* influences the orientation on renewal or replication. If a CEO is too long with the firm, he or she will embrace the successes in history and will therefore focus on business model replication. If a CEO is too short within the firm, the focus will be on business model replication too. This can be explained by the need for a CEO to prove his capabilities to lead the firm and thus focus on short term success. CEO's that are in the firm between three and thirteen years have a positive effect on business model renewal (Volberda et al., 2017, p. 126).

3.4.3 Level of external orientation

To innovate its business model, a firm needs the capability to interact with its environment, identify new knowledge, process this acquired knowledge in the firm and commercialize it. To what degree a firm is capable to do so is defined as *the absorptive capacity* of an organization(Cohen & Levinthal, 1990). The importance of developing social and intellectual capital by organizations is stressed by the research of Nahapiet & Ghoshal (1998). They argue that the ability to exchange intellectual capital is depending on a firms social capital and that firms having this ability have a competitive advantage (Nahapiet & Ghoshal, 1998, p. 242). These firms may have an advantage in transaction and coordinating costs and even have an advantage in growth and dynamic efficiency. Thus firms that invest in social capital have an advantage over the market and will be able to absorb early signs of change, ahead of competition. The absorptive capacity has a positive effect on both renewal and replication. In particular business model replication has benefit of the absorptive capacity, which can be explained by the idea that replication takes place with existing customers. For existing customer relations, there is already social and intellectual capital in place, thus creating new knowledge goes faster than with new customers (Nahapiet & Ghoshal, 1998, p. 260; Volberda et al., 2017, p. 127).

Listening to customers is a strategy that assures that the products are in line with customer expectations. Listening too much to existing customers will hamper radical innovation since the current customer base is used to the current performance of the products a firm makes (Bower & Christensen, 1995). If a firms listens too long to its current customer base it might end up in a competence trap (Volberda et al., 2017, p. 129) since they will incrementally develop products that fit current customer needs, without developing radical different products and thus new competencies. The dilemma to search for new customers without losing your current customers base is described as "the innovators dilemma" by Christensen (2013). Listening to customers has a negative impact on business model renewal, but a positive impact on replication.

3.4.4 Organizational characteristics

Large firms have several advantages over smaller firms. Large firms have more resources, often a better reputation and higher customer confidence. They are also better in managing their external environment. The disadvantages of a large firm is that they are inert to change and respond slower

to changes in the environment than smaller organization (Chandy & Tellis, 2000; Weiblen & Chesbrough, 2015). The research of Volberda, van den Bosch & Heij (2017) indicates that *firms that grow* often use business model replication over business model renewal. This is in line with Penrose (1995), who says that growth of a firm is a planned action and needs managerial resources. She argues that: *"Nevertheless, the firm cannot, and in general will not attempt to,extend its expansion plans, and with them its 'management team', in an effort to take advantage of all such opportunities. It cannot do so because the very nature of a firm as an administrative and planning organization requires that the existing responsible officials of the firm at least know and approve, even if they do not in detail control all aspects of, the plans and operations of the firm; it will not even try to do so if the officials of the firm are themselves concerned to maintain its character as an organized unit."* (Penrose, 1995, p. 45). Thus management always prefers to replicate the business model over renewal of the business model, since renewal introduces changes into the management of the firm.

3.4.5 Institutional enablers

Corporate governance can be divided into two main stream models: Anglo-Saxon and Rhineland corporate governance models. The Anglo-Saxon model seeks to maximize shareholder value and is very common within the stock exchange listed firms (Bezemer, Zajac, Naumovska, van den Bosch, & Volberda, 2014). The Anglo-Saxon model is often short term oriented. Management of these firms act as an agent to the shareholder. Control of the management by the shareholder is assured by incentives that align the interest of the shareholder with the top management.

The Rhineland model on the other hand is a model of balancing all stakeholders interests and has a long term orientation. Typical firms that have the Rhineland model are those firms that are family owned or not listed on the stock exchange. They have a long term orientation and are often better in renewal of their business model than short term oriented Anglo-Saxon firms. An interesting exemption to this is when a listed firm tries to become technological leader. Shareholders often react positively to change when the result will be a firm which is technologically superior to its competitors (Volberda et al., 2017).

Compliance to law and regulation can both act as an enabler and as an inhibitor of business model innovation. In general, laws and regulations apply for every firm in the sector and thus do not add to the competitive advantage of a single firm. Yet, non-compliance with law and regulation can be a competitive advantage, at least temporarily. In particular disruptive firms like Airbnb and Uber show that non-compliance can be part of a competitive advantage: they just deny that they have to comply with certain laws or regulations since they only act as a platform and cannot be held responsible for the acts of the users of their platform on both the supply and demand side. Local law enforcement however, becomes increasingly successful in dealing with Uber and Airbnb by either making their model illegal or forcing the firm to adapt the business model in such a way that it does comply with law and regulations.

A firm can also choose to become early adaptor of new laws and regulations, or even over-comply. This can give the firm a competitive advantage in the future, since the firm is already capable of dealing with these new rules and regulation. A firm, or a group of firms, can even influence lawmakers to adapt the new industry standard into law and regulation. Giving the group of firms a clear competitive advantage.

Renewal can also be inhibited by laws and regulations. In most of the cases this is probably the reason for the existence of the law in the first place. Society wants products, employment, corporate governance and the ecological environment to be up to certain standards and keep it there. Society expects that new medicines are safe and help a patient overcoming the disease. That is why it takes exhaustive and expensive testing of the medicine before it comes to market. This same effect also protects firms from unfair competition. Patents for instance assure that the investments on innovation can get their reward by replicating the business model. Competition will not be able to exactly copy the product, but firms should be aware that this kind of security is often false security.

3.5 Conceptual Framework

In the next section, based on the literature review, three propositions and a conceptual framework is developed.

3.5.1 Propositions

Considering the context of this research and the literature review, three propositions are developed in order to be able to answer the central research question **"How does management of established, capital intensive firms, in an industry that experiences strong fluctuations in demand, use the four levers of business model innovation over time in order to influence competitive advantage?"**

3.5.1.1 Proposition 1 – Management and growth

During growth firms can choose to replicate their business model, build a new business model or develop a dual approach where the firm renews its model while sustaining profitable models. If a firm is only able to replicate their business model and is not able to change their business model, it will lose competitive advantage and lose business on the long run(Johnson et al., 2008). Firms need to be able to re-invent their business model (Chesbrough, 2010) and the capability to do so is considered as a competitive advantage (Bertolini, Duncan, & Waldeck, 2015; Zott et al., 2011).

Renewal needs more managerial resources since renewal needs more coordination, goal setting and control of the process. Yet, according to Penrose (1995) all growth by a firm is planned in some way and there need to be managerial services available before the actual growth is taking place. Clearly making growth a planned action and describing that during growth the surplus on managerial services will diminish, since the established growth itself needs coordination.

Penrose (1995) explains that if a firm operates at maximum efficiency, there will be no managerial services available to manage the growth of a firm. Meaning that either the firm does not grow, or the firm grows less efficient and thus generates less profit per capital employed. The management needed to coordinate this growth will be hired from the market. To get the hired managers up to firms' standards, time is needed. There will thus be no incentive within the top management team to grow and if a firm does, it will likely do so with minimum managerial resources.

Thus the first proposition is:

Proposition 1 – Management and growth

During a period of growth, management of established capital intensive firms are likely to use business model replication in order to sustain the competitive advantage

3.5.1.2 Proposition 2 – Management and decline

Continuing on the first proposition, a second proposition is developed for the surplus of management during decline in a firms demand.

If in a similar way, a firm encounters a decline in demand it thus encounters a surplus of resources. These resources include management. Penrose (1995) stresses the role of entrepreneurial management within a firm. She describes two types of managers: "the businessman" and "the entrepreneur". Where the businessman lacks the ambition to maximize the opportunities to firm growth and the entrepreneur who "*drive in the same circumstances to expand their operations in an unending search for more profit, and perhaps greater prestige"* (Penrose, 1995, p.35). These two types of management have clear similarities with literature of business model innovation, where business models can be replicated or renewed, and ambidextrous organizations (Jansen, Van den Bosch, & Volberda, 2006) who strive for exploitation of the current business model and exploration for new opportunities.

The lack of entrepreneurial services is not the greatest inhibitor of growth to a firm. Penrose (1995) describes that *"for the most effective restriction on the quality of entrepreneurial services is that which stems from a lack of interest in experimenting with new and alien lines of activity, or in moving into new geographic areas."* (p.35). She explains that the lack of entrepreneurial management can be overcome by hiring the right managers. But if existing management is not willing to do so by the lack of interest, then the firm will run into trouble since a bull market does not sustain forever. Keeping the status quo is therefore not an option for management of these firms. Penrose (1995) describes *"Such conditions do not last indefinitely and the unenterprising firm ceases to expand as this type of opportunity declines"* (p.34). She concludes that *"Thus, the managerial competence of a firm is to a large extent a function of the quality of the entrepreneurial services available to it."* (Penrose, 1996, p.35).

Since a surplus of management can result in a surplus of entrepreneurial services, it is more likely that business model renewal takes place around or during a period of decline in a firms demand. Since the available entrepreneurial services will try to renew the business model.

Thus the second proposition is:

Proposition 2- Management and decline

During a period of decline in demand, management of established, capital intensive firms are likely to renew their business model, in order to develop a competitive advantage

3.5.1.3 Proposition 3 – Capital intensity

This thesis tries to explain how capital intensity influences the ability of firms to change their business model. In the end, capital intensive firms need to change and develop their technology to stay competitive. Yet, the capital intensive nature of their assets hinders them to do so. Especially high capitalization and strong antecedents appear to have strong influence on the capabilities of firms to change their business model (Amit & Zott, 2015; Volberda et al., 2017, p. 107). These assets act as an inertia to change (Volberda, 2004, p. 90) and become a burden to business model innovation.

Furthermore, according Penrose (1995), management of established, capital intensive firms is biased towards maximising revenue from existing resources and thus prefer to keep the status quo. Management wants to maximise revenues on their existing assets (Penrose, 1995, p. 67) and does not want to take risk and experiment with their expensive assets (Chesbrough, 2010, p. 358). These companies might end up in a business model trap (Volberda et al., 2017, p. 12) and become vulnerable for a Schumpeterian shock (Amit & Schoemaker, 1993, p. 39; Schumpeter & Opie, 1934), which potentially ends the firm.

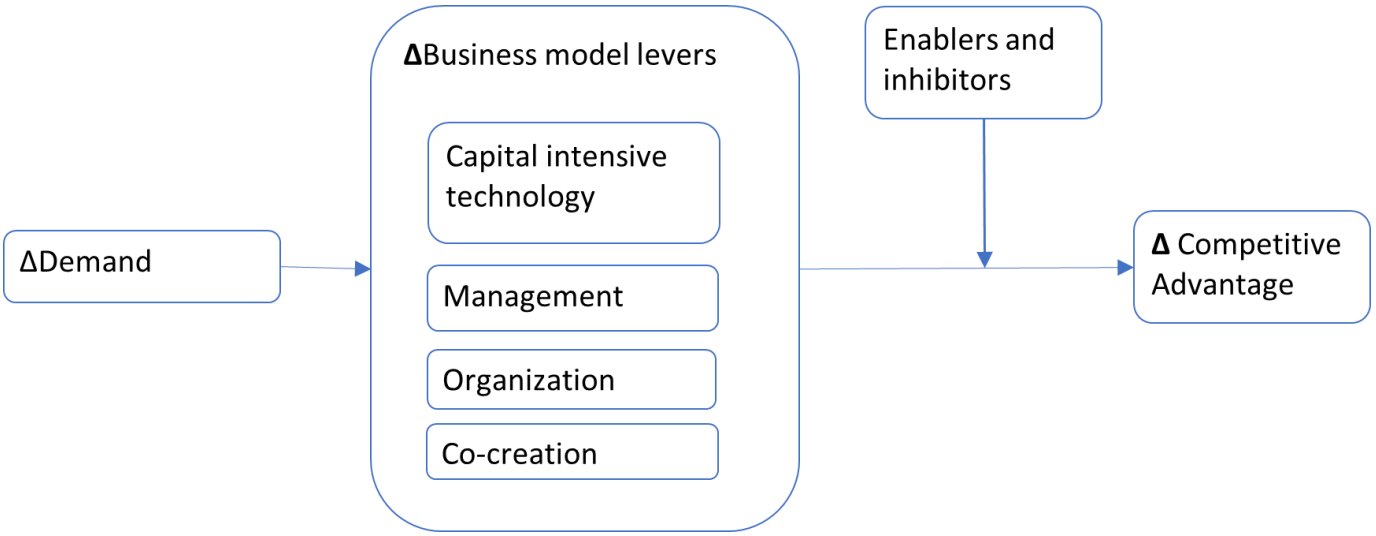
A dynamic environment has a positive relation towards exploration for new business (Jansen, Tempelaar, van den Bosch, & Volberda, 2009). It is thus likely that if capital intensive firms do change their technology, this is driven by an external force that pushes management to change. Within business model literature this is likely to be a new demanding customer, therefore proposition three is:

Proposition 3 – Capital intensity

External forces, like new demanding customers, positively influence renewal of the lever of technology and support the creation of a competitive advantage for established, capital intensive firms

3.5.2 Framework

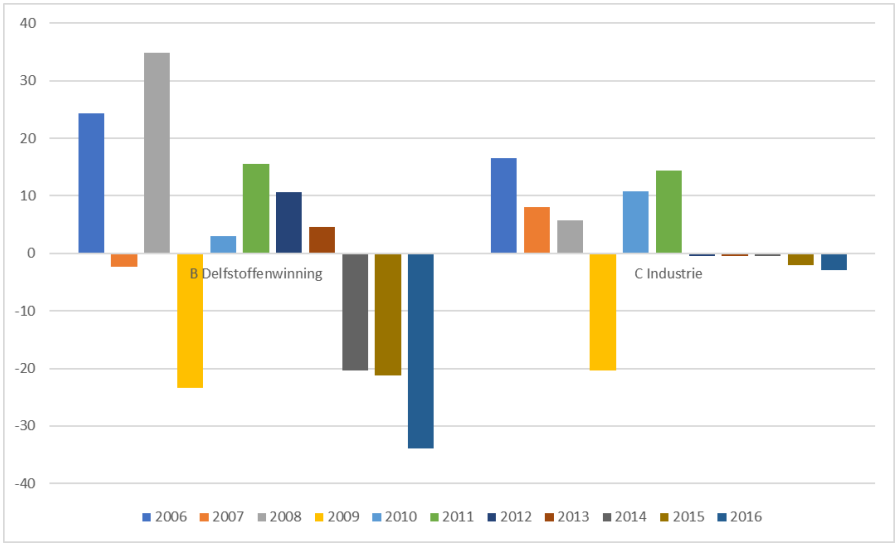
Figure 6- Research framework on business model innovation for established, capital intensive firms



4 Research methodology

This thesis will focus on the capital intensive firms and how capital intensive, fixed assets acts as a constraint to business model innovation. Therefore the firms selected need to be in the position that they own large assets and have the people to operate these assets. Contrary to the services sector, the industry and mining sector are known for their expensive assets. Data from the Dutch Centraal Bureau voor de Statistiek (CBS, 2018) shows that over the last decade there has been strong year to year fluctuations in turnover for the industry and mining (oil and gas) sector.

Graph 1 - Year to year revenue development per sector (CBS, 2018)



The type and size of the firms will be the large established firms since it can be expected that they specifically will face this problem due to their antecedents (Amit & Zott, 2015; Volberda et al., 2017, p. 107). Research in the Dutch maritime and manufacturing industries shows that firms typical for

having this challenge are Tata Steel Ijmuiden, Damen Shipyards, and IHC. Table 6 clearly shows that shipyards like AMELS or Damen Schelde Naval Shipbuilding (DSNS) have a very high value of assets per employee compared to service firms like Randstad and Bureau Veritas. Furthermore the revenue of these companies fluctuated considerable over the last 10 years.

Table 6 – Employee and fixed assets ratio for several firms

Firm	Revenu in th	Employees per 31-12-2016	Fixed Tangible & Other Assets in th	Fixed asset/Employee Ratio in th	Source
Randstad	$ 21.803.109,81	658580	$ 8.273.000,00	$ 12,56	Annual report, only financial assets
Bureau Veritas	$ 27.300,00	109	$ 318	$ 2,92	Annual report
Amels	$ 251.659,95	206	$ 24.682,80	$ 119,82	Annual report
DSNS	$ 126.894,61	466	$ 51.549,00	$ 110,62	Annual report

This research uses an inductive, qualitative method to generate theory on the mechanism of business model innovation for capital intensive firms. To generate theory from qualitative research, a multiple case study was conducted. In general, a case study provides in depth analysis over a number of firms, organizations or events over time (Easterby-Smith, Thorpe, & Jackson, 2015). Case study research *"is a research strategy which focuses on understanding the dynamics present within single setting"* (Eisenhardt, 1989). It is thus believed to be appropriate to be applied to this thesis. Especially the Eisenhardt (1989) approach to case study research is appropriate since it provides flexibility in the approach of the research and is designed to generate theory instead of testing theory. Based on the literature review, propositions are developed and a conceptual framework is drawn accordingly (Webster & Watson, 2002).

Multiple cases are developed for firms that match the following criteria:

- Asset / Employee ratio >$40k
- Firms or their ancestors exists over 20 years
- Firms experience strong (>15%) fluctuations in demand over the last 10 year

In table 7, typical indicators for a change in a business model are shown. Which can be, amongst others, the announcements of sales, investments, new products, changing management positions, joint ventures, take-overs or divestments or a change in any of the business model components as described by Johnson et al. (2008).

Table 7- Typical indicators for business model innovation

- New products
- New sales
- Change in management positions
- Change in organization
- Investments / divestments
- Teaming with others
- Opening / closing subsidiaries
- Geographical change in business

At which intensity the business model was changed is indicated from low to high in five steps. For every lever it is indicated if the lever is used for renewal or replication. A rationale is given in order to justify the valuation of the event.

By using secondary data such as annual reports, databases, newspaper articles and other professional magazines, case studies were developed. The timeline is 2008-2017 in order to assure that the interviewee was able to remember what happened at that time. Furthermore it can be expected that in recent years the need of business model innovation was more urgent since business nowadays is much more volatile as before (Kaeser, 2018).

Table 8 - Typical sources of data for building the case studies

Primary data

- Interview with member of the top management team

Secondary data

- Newspapers
- Press releases
- Annual report
- Professional literature

Firm Internal Documents

- Policy Plan
- Organigram

To understand in how the levers of business model innovation were used by the firms semi-structured interviews were held with management of these firms. An interview topic guide is used, together with a firm specific report (Eisenhardt, 1989). As a result, the data collected will be on topic and the interviews can be limited in time. This report contains all the events relevant for business model innovation as experienced by the focal firm. The interviewee thus has time to search for information regarding the events. Furthermore, the interviewee can determine if the events mis some specific, important, events on business model innovation which should be in the report. During

the interviews, bias by the researcher is limited by using appropriate interviewing techniques, such as the use of laddering and the use of probes (Easterby-Smith et al., 2015, pp. 138 - 146; Van Tulder, 2012, pp. 187 - 216). Interviews were held at a location provided by the interviewee. A raw version of the interview was communicated with the interviewee in order to provide the opportunity to the interviewee to change or nuance their answers to the questions asked. The final version of the interviewee and the case is communicated with the interviewee before publication.

During the interviews the main question is how the business model was changed, by use of which levers, were the levers either improved or changed and in what combination or sequence? According the method of Eisenhardt(1989), first a within-case analysis will be conducted, comparing the results of the interviews for one single firm. The determination on whether a lever was replicated or renewed is determined by the indicators as addressed in Table 1 and Table 2. Which lever was part of the business model innovation and the driver for business model innovation is mainly determined during the interview in consultation with the interviewee since most of the events cannot be analysed without understanding the background and context of the event. During the interviews, quotes that indicate business model innovation were noted, particular attention was given to quotes that indicate the impact on the business model.

For every firm, indicators on employment, revenue and asset / employee ratio are given. This information shows that the firms are capital intense firms and encounter strong fluctuations in demand over time. The structure of organization within the larger group of companies and the structure of management is showed. The indicators were confirmed during the interviews and the structure of organization and management was determined with help of the annual reports and confirmed during the interviews.

From the list of sequential events, a table is made which shows which levers are used, if they were renewed or replicated. In the next columns, the driver of business model innovation is mentioned and supporting information on the determination of the event is mentioned, which include information from primary and secondary sources. The last columns provides information on the impact of the event on the business model.

With help of this table, several analysis are made which focus on the main driver for business model innovation, the number of levers used and if levers were renewed or replicated. Then the business model innovation matrix is developed and, by adding the sequence of development, the business model transformation paths is determined. If multiple, contradicting events occurred in the same year, the main resulting business model innovation is mentioned in the business model innovation matrix.

Next to the table of events, quotes from the interviewee are used to determine the enablers and inhibitors that the focal firm encounters in changing the business model. For every firm, the influence of the enablers and inhibitors is determined with help of the interview. Since this thesis is focussing on capital intensity of the technology lever, capital intensity is added as part of the enablers and inhibitors during the interviews. The analysis of each case is summarized with the main findings displayed in a text box.

Secondly, following Eisenhardt (1989), a cross-case pattern search is conducted, comparing the different firms in their endeavour to change their business models. The cross-case analysis follows the same structure as the within-case analysis, but this time for all events of all firms. In order to find typical patterns, all events are added in one table and with help of computer analysed, colours were added to visually indicate patterns in the business model innovation of all firms. The result is displayed in several graphs that mainly follow the pattern of the individual case analysis. Where found relevant, extra detailed graphs for the cross-case analysis are displayed. The cross-case analysis is summarized with the main findings displayed in a text box. This results in a thorough understanding on how established, capital intensive firms change their business model over time.

5 Results

5.1 Case study firm A

In this chapter, the results of the research and interview with management of firm A are presented. Data from the research is analysed by determining which levers were used and how. Were the levers replicated or renewed? The driver for business model innovation is determined and also the impact on the business model. The determination is explained by the use of clear data or quotes from the interview. Subsequently the inhibitors and enablers for firm A are further elaborated. This chapter ends with a thorough within-case-analysis on how firm A uses the levers for business model innovation and the role of management.

Table 9 - Data sources for the case of firm A

Interview

- A 60 minute interview was held at the 18th of May 2018 with undisclosed member of the top management team. The interview was not recorded and notes were made. Particular attention was made to quotes indicating business model innovation, resulting in 2 pages of interview details and quotes.

Newspapers

- Het Financieele Dagblad (2008 – 2018)
- Provinciaale Courant (2008 – 2018)
- Het Reformatorisch Dagblad (2008 – 2018)
- NRC.NEXT (2008 - 2018)
- NRC Handelsblad (2008 – 2018)
- The Canadian Press (2008 – 2018)

Financial Data

- Data from the annual reports (2008 - 2018)

Other sources

- Press releases by the firm (2008 – 2018)
- Website of the firm
- Gids voor Personeelsmanagement (2008 – 2018)

Internal documents

- Policy Plan
- Organigram

5.1.1 Introduction

Firm A is a shipyard located in Western Europe. The firm was founded over 100 years ago and has delivered over more than 400 ships since then. After bankruptcy in the 1980s', firm A focused mainly on shipbuilding for the government. More recently, firm A was taken over by a larger group of shipyards . With the help of the group, firm A successfully entered the export market. Within the group of companies, firm A is the sole knowledge centre of high-tech complex ships. Firm A acts operationally independent from the group. All capabilities and facilities needed to engineer, procure and produce a ship are in-house available. Especially the capability and assets to produce ships makes the firm capital intensive, as shown in Graph 2. Since the takeover, sales has moved to the headquarters. The position of firm A within the group of companies is explained in Figure 8. The layers of management are explained in Figure 7. Management is divided into three layers: top management, middle management and lower management: the team leaders. Lower management directly lead the employees in their work.

5.1.2 Organization

Figure 7 – Organization of management in firm A

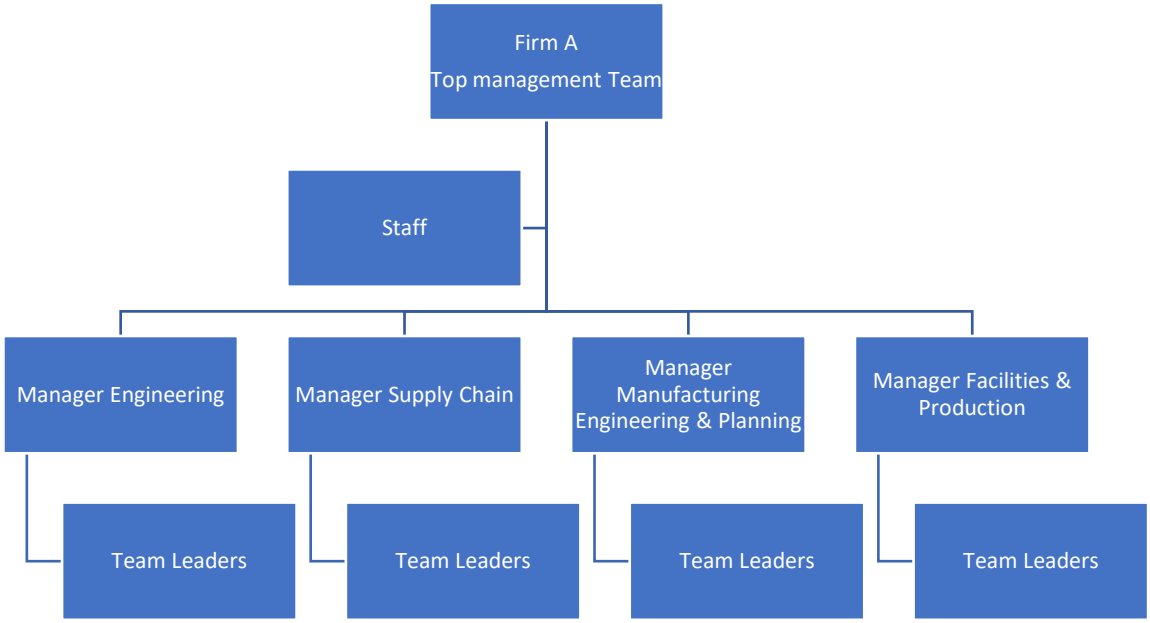
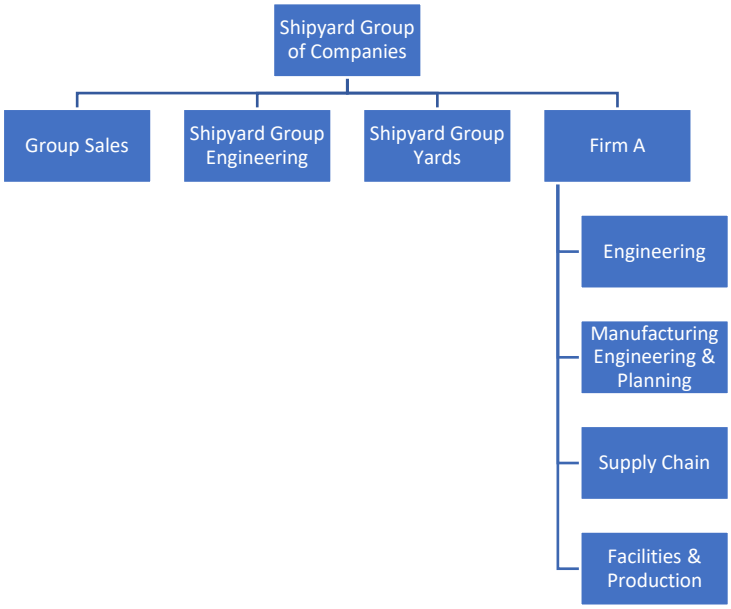


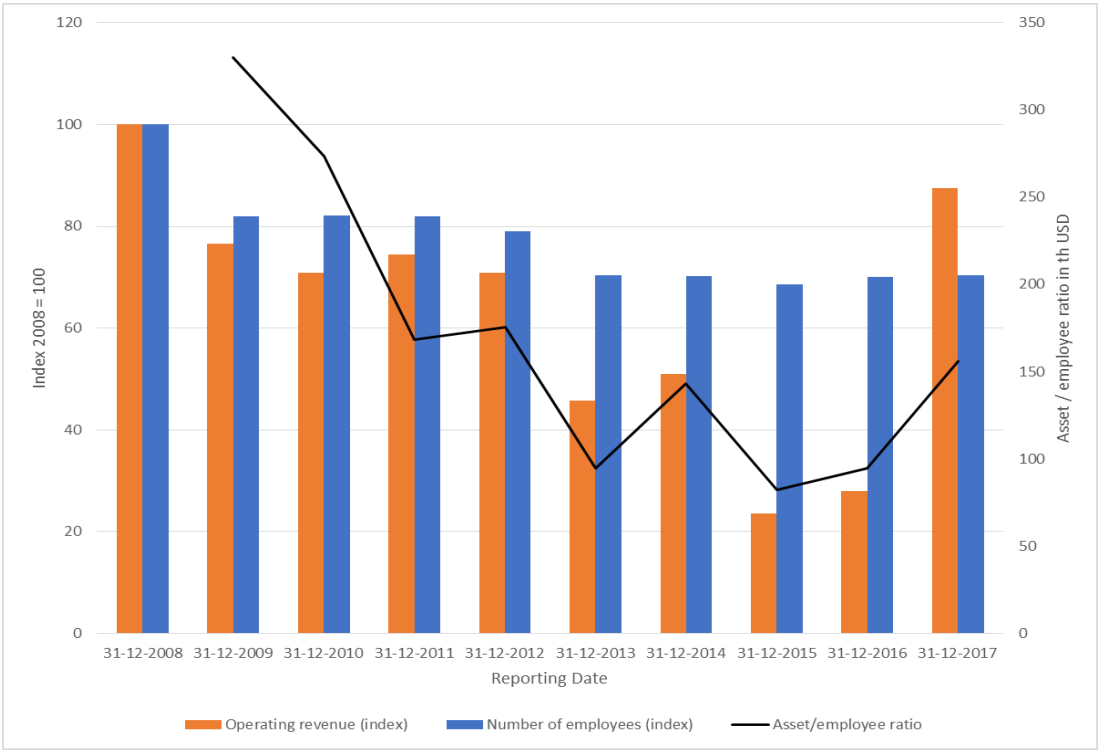
Figure 8 – Position in the shipyard group of companies



5.1.3 Results for the case of firm A

The number of employees and revenue for the period of 2008 – 2017 can be found in Graph 2. For anonymization purposes, indexes and ratios are used. The asset/employee ratio for 2008 could not be retrieved since the data of the assets for that time could not be confirmed.

Graph 2 – Revenue, employees and tangible asset/employee ratio for firm A, source: annual report



5.1.4 Within case analysis

Considering the indicators for renewal or replication, a distinction can be made between replication or renewal for each of the business model levers and thus the business model. In the table below, events relevant for the research question, distilled from primary and secondary data are displayed in a chronological order. For every event is shown what lever of business model innovation was used and if it was used for renewal or replication. The driver for business model innovation is determined and an explanation is given for the determination. Impact on the business model is scaled from low to high in five steps and was checked during the interviews.

Table 10 – Events of business model innovation for firm A

Event of business model innovation	**Levers renewed**	**Levers replicated**	**Driver of business model innovation**	**Rationale**	**Impact on business model**
1. Patrol ships	T, M, O	Co	Customer	The customer is known to firm A. But it was the *first* time that two of the four ships were *fully build at the sister yard* abroad (NRC Handelsblad, 2007).	Medium
2. Ships for North Africa	T	M, Co	Customer	This order was the *first one* in North Africa. To build them, the firm needed to develop *new production technology,* which gives *new* capabilities. (NRC.NEXT, 2008). The order came around 2009. To be able to produce the ships*, investments were made* at the yard where current *production capacity was improved* and a new launching facility was made (Interview firm A, 2018). The ships are *custom made*, based on a previous design.	Medium
3. Large high-tech vessel for existing customer	T	M, O, Co	Customer	In 2009-2010 the sale of a large high-tech vessel was achieved. Firm A introduced a *new to the world product* in a very short time, where competitors needed over 6 years of negotiating and designing (The Canadian Press, 2010). A *new to the world vessel*, fully	Medium

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				developed, designed and produced in close cooperation with the *existing* customer. The vessel is partly build at a sister yard, which is a *known* strategy for the firm and the customer.	
4. Management and organizational changes	M, O		Strategy	Around 2011 *management* decided to let go of production employees since there was no work for them anymore in their local yard. The focus on efficient single skill personnel *shifted to multi skill approach* and the ability to lead production activities abroad.(Reformatorisch Dagblad, 2012; Het Financieele Dagblad, 2012). *The firm changed* to a less production firm and more towards a knowledge based firm (Provinciale Courant, 2011; Het Financieele Dagblad, 2011). A *new management system* was introduced in order to assure that in-house knowledge would not disappear when the people of the firm go on retirement (Gids voor Personeelsmangement, 2011) Furthermore the *organization and management was changed*. The organization moved from a department oriented organization towards a project oriented organization making the project director responsible for the result of the project. The *empowerment* of the project director was *increased*	High

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				significantly, providing him all the power needed to steer the same project as needed. The loss of production employment, the focus on production knowledge, the *change to a project oriented organization* and the *empowerment of the project director* indicate internally oriented renewal.	
5. Ships for South East Asia	T, M, O, Co		Customer	During the same year, a deal was closed with an Asian government on the delivery of two new type of ships. This deal included that the ships will be partially built at a local shipyard, *as requested by the government* (The Jakarta Post, 2012) The *change* to modular building, the *local production* with a local team and the final testing and delivery in Asia, result in *radical renewal* on all four levers.	Medium -High
6. Sail Training Vessel for Arabic country	O	T, Co	Customer	Around 2014 the government of an Arabic country gave the order for a steel Sail Training Vessel. The product is an *adapted copy* of previous designs and within the group of shipyards they have worked with each other before, although this time in a *new constellation* with a different customer. The management and procurement of this project was done at *the headquarters*, but the engineering, final outfitting and commissioning	Low

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				was done at the local yard(Press Release, 2014).	
7. Teaming with Scandinavian Firm	T, M, O, Co		Customer	Due to the necessary replacement of high-tech governmental ships, *the firm decided* to *team-up* with Scandinavian firm around 2015 in an attempt to acquire the knowledge and expertise to build *these new high-tech vessels* in local yard. (Het Financieele Dagblad, 2015; Press Release, 2015)The development of these new ships result in strong business model renewal: Firm A acquires new knowledge and the Scandinavian partner is a new co-developer which needs specific managerial and organizational changes.	High
8. Vessel for Australia	T, M, O	Co	Customer	In the same period firm A was selected, in a *teaming agreement*, to deliver the replacement of large governmental vessel in Australia. The new vessel will be capable of sailing to the south pole. Engineering and project management is done in Western Europe and the construction and commissioning will be done at the sister yard. A market *unknown* for firm A and a true state of the art, *new and high-tech product developed and produced*. The customer has very specific demands related to quality assurance	Medium -High

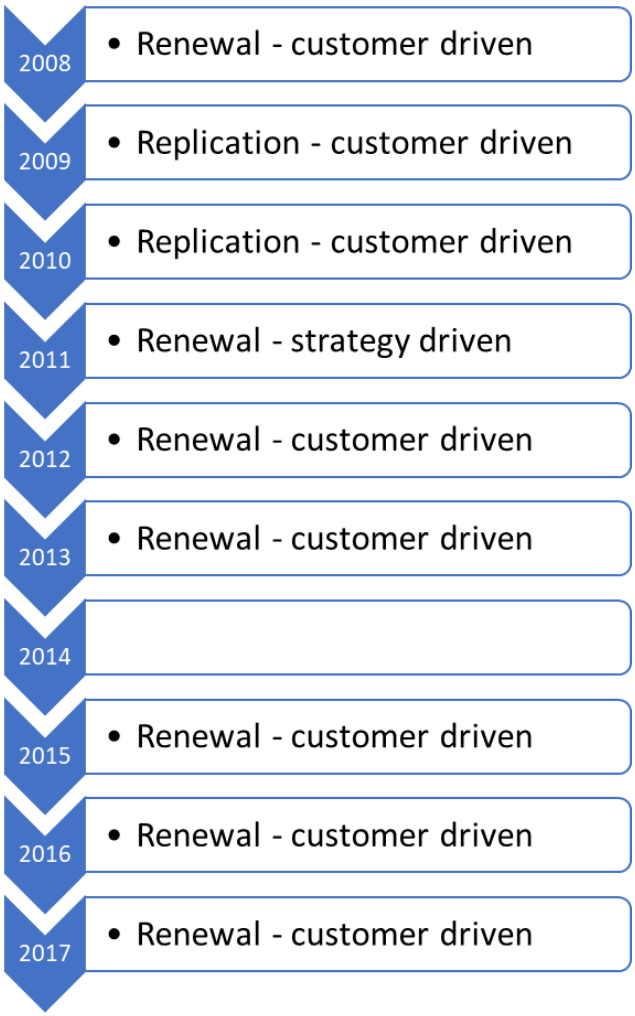
Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				which needed *specific organizational and managerial changes.* The contract became effective in April 2016. (Press Release, 2015; Press Release, 2016; Press Release, 2018)	
9. Vessel for West Africa	T	Co	Customer	In the same period the order came from the government of a West African country to build a research vessel. *Once again*, the engineering, procurement and project management is done in W*estern Europe and production at the sister yard* (Het Financieele Dagblad, 2016). A completely *new product*, organized and managed *like previous projects for a customer known to firm A*. This state-of-the art vessel is fully equipped with high tech sensors and has special class notation on underwater radiated noise, which makes the product very special.	Low
10. Vessel for Middle America	T, O	M, Co	Customer	Around 2016 the contract for a vessel for Middle America was also signed. The project approach is comparable to other projects, where a large part of the vessel will be *built locally*. The sales makes it the first sales in Middle America for firm A (Press Release, 2017; Provinciale Courant, 2017). The *development* of *new production technology* was necessary to produce the vessel at the local yard. Firm A organized a *new*	Medium

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				site team with a mix of local people and a *new production method* was developed.	
11. Teaming with North European firms	T, M, O, Co		Customer	During the same year, firm A teamed up with two other firms in an attempt to acquire the contract for building vessels for a Northern European country. The development of this product is *a cooperation of the three companies* (Het Financieele Dagblad, 2018). For Firm A this will be *a new customer and the product will be state of the art and fully in line with customers' requests*. For this project firm A will acquire most of *the resources from the customers' country*, which is completely *new* for firm A. The vessel will be built locally and this requires *new organizations and new management*.	Medium -High

5.1.4.1 *Timeline on business model transformation*

The timeline below shows the mayor type of business model innovation in chronological order.

Figure 9 – Timeline of business model transformation by firm A



5.1.4.2 *Enablers and inhibitors of business model innovation for firm A*

During the interview, several factors that inhibit or enable business model innovation were elaborated.

The *type of leadership* within firm A can be described as transactional. Every employee needs to badge their working hours and declare weekly to their manager where they have been working on. Recently some older managers have left for retirement, making room for changes in management style.

The *organizational identity* is very clear. Firm A is the sole entity within the group that can engineer, procure, build and commission complex vessel for mainly governmental organizations. Recent successes bolster this identity.

The *managing director* joined the company around the millennium. Shortly thereafter he was appointed to his position. Several other managers are in their position only a couple of years but do have experience in shipbuilding.

The *absorptive capacity* of firm A is expected to be high. Since decades firm A works in a cooperative way with the customer and subcontractors.

Firm A *listens to the customer* intensively (Interview firm A, 2018). This does influence their ability to innovate. Pending on the desires of the customer, the product will be cutting edge or proven design. Firm A does not push an innovation to the market.

Internal cooperation is limited (Interview firm A, 2018) . Firm A is organized in a project and matrix organization. The type of product, the organization of the project and the systems and processes used for each project differ significantly, making it hard to learn from other projects.

Due to recent orders*, organizational growth* is a current subject for firm A, but does not hinder them in renewal. This is caused by the project organization which enables every project manager to decide as needed to deliver the project (Interview firm A, 2018).

Due to substantial changes in demand, it is hard to deny the short term. But in general *corporate governance* is long term and not influenced by shareholders' short term focus. Firm A is a private company and has one shareholder(Interview firm A, 2018).

Compliance with laws and regulation clearly influences the ability to produce ships at a competitive price in Western Europe. As the interviewee mentioned: "New laws and regulations makes building in Western Europe increasingly expensive" (Interview firm A, 2018).

Capital intensity does influence the ability to innovate. During the reorganization, firm A chose to keep the shipyard as it is, although the utilization of the shipyard will remain low for the future. There are two main reasons to do so. First of all, firm A wants to be able to build ships in Western Europe if the government requires firm A to do so. Secondly, firm A wants to keep the knowhow of the production and commissioning process in house. In the past several shipyards closed down and specialized into an engineering company. History shows that these companies are never requested to be main contractor. Firm A believes in the concept of being main contractor, since that is part of their history and identity and this is part of the business model. Firm A thus accepts the low utilization of the assets and incurs a loss on the assets every year without production in Western Europe. At the same time, production knowledge from Western Europe enables firm A to build vessels on the shipyard of the customer's choice. This example provides evidence that firm technology and capabilities are strongly related to each other.

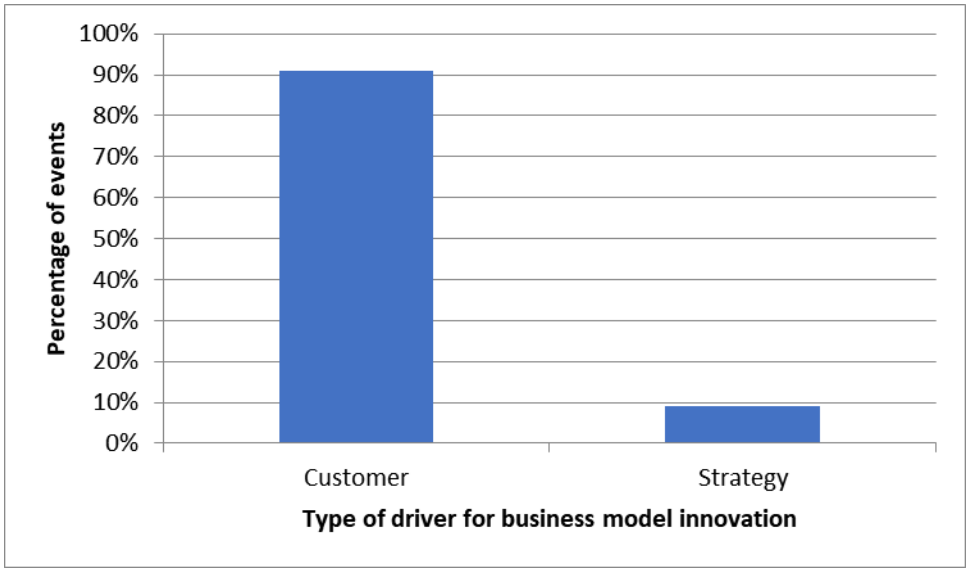
5.1.4.3 *Summary of analysis*

In the following section, the analysis is summarized into five important observations. These findings show the main driver of business model innovation for firm A, which levers were used and the role of management in business model innovation.

Table 11 – Main observations from the case study for firm A

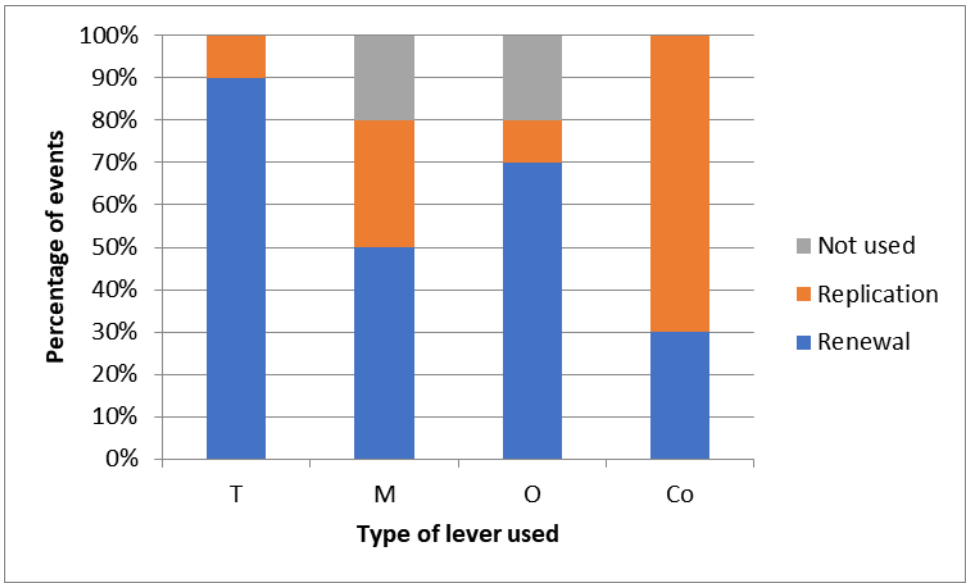
- Mainly uses customer driven business model innovation.
- Mainly uses the co-creation and technology levers.
- Used once strategy driven renewal to reorganize the firm.
- Never used only one lever.
- Moved from customer driven renewal, to replication, to strategic renewal and back to customer driven renewal.

Graph 3 – Observation 1: Customer or Strategy driven innovation



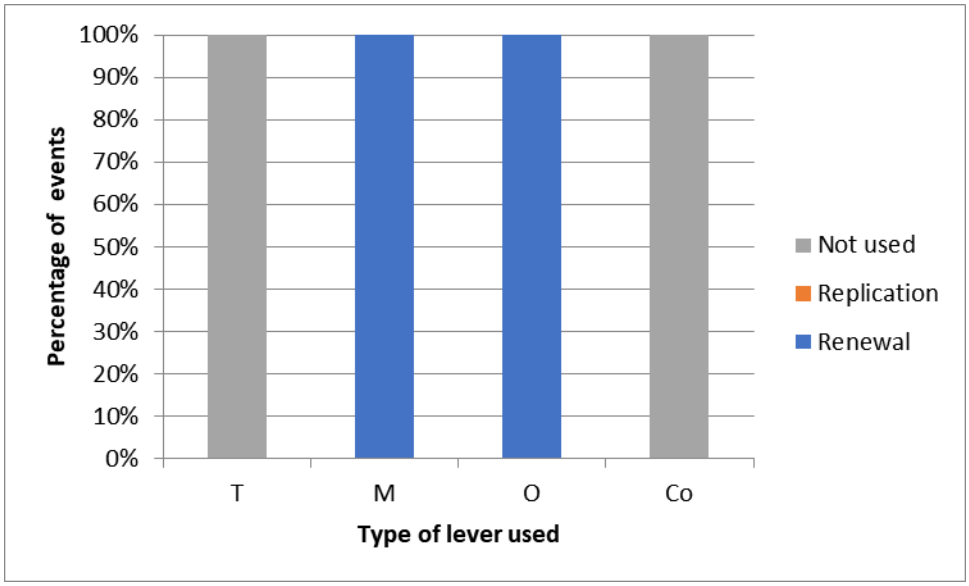
First of all, as shown in Graph 3, for 11 events of business model innovation, 91% of the events the driver is the customer and only 9% strategy.

Graph 4 – Observation 2: The role of the levers for customer driven innovation: replication or renewal



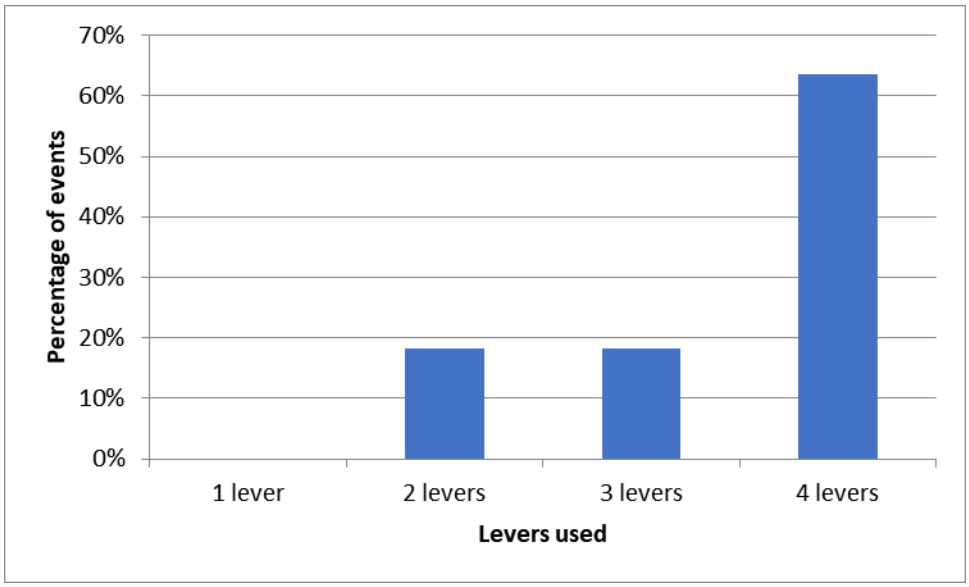
Second, all customer driven events make use of the lever of technology and co-making. Graph 4 shows the distribution between replication and renewal. The lever of technology is renewed 90% of the events and replicated 10% of the events. The lever of co-making is replicated 70% of the events and 30% of the events renewed.

Graph 5 – Observation 3: The role of the levers for strategy driven innovation: replication or renewal



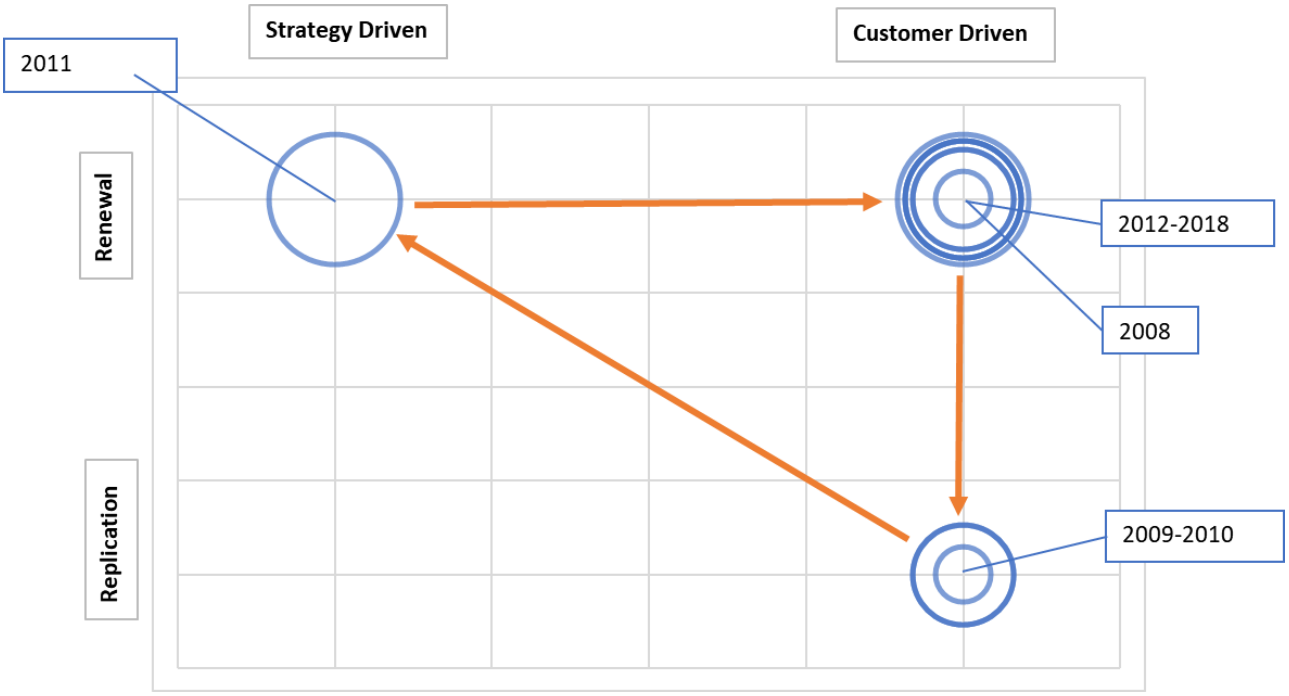
Third, strategy driven innovation involved only management and organization.

Graph 6 – Observation 4: Number of levers used



Fourth, as shown in Graph 6, firm A never used only one lever. In 18% of the events two or three levers and 64% of the events four levers were used to change the business model.

Figure 10 – Observation 5: business model innovation matrix of firm A



And fifth and final, an analysis is made on the business model transformation process. In Figure 10 the chronological steps taken by firm A for transforming the business model are shown. All events are taken into account and the size of the rings show the impact on the business model. Firm A moved from customer driven renewal, to customer driven replication, to strategy driven renewal and back to customer driven renewal.

5.1.5 Discussion and implications for the case of firm A

Firm A is very customer oriented in their changes of the business model. Replication of the business model is used if the customer is focussing on renewal of technology only. By replicating the levers of management, organization and co-creation, firm A tries to keep costs low and maximize revenues. After strategically renewing the organization, firm A was prepared to even better fulfil the demands of the customer and became even more customer oriented. Apparently, management of firm A was able to understand the need for change and did so successfully. The firm changed relatively smooth from a department oriented organization towards a project oriented organization. And since firm A focusses on the role of main contractor, the requests from the end customer will penetrate into the organization, enabling customer driven renewal with help of the absorptive capacity of firm A. Technology is almost continuously renewed in either new designs of products or inventing new production technologies. Co-creation is the lever which is used in replication and renewal. If renewal takes place with the co-creation lever, the result is a very strong change of the business model. See events 5, 7 and 11. The delivery of the mentioned products takes several years. Since both replication and renewal takes place in parallel, it can be argued that firm A is capable of working with different business models at the same time. This requires a firm that can deal with high innovative projects and cost efficient projects in subsequent order and at the same time. Thus management and the organization needs to have dynamic and ambidextrous capabilities (Jansen et al., 2009). The implications for management to be able to work with different models at the same time will be further elaborated in the discussion and implications chapter.

5.2 Case study firm B

In this chapter, the results of the research and interview with management of firm B are presented. Data from the research is analysed by determining which levers were used and how. Were the levers replicated or renewed? The driver for business model innovation is determined and also the impact on the business model. The determination is explained by the use of clear data or quotes from the interview. Subsequently the inhibitors and enablers for firm B are further elaborated. This chapter ends with a thorough within-case-analysis on how firm B uses the levers for business model innovation and the role of management.

Table 12 – Data sources for the case of firm B

Interview

- A two hour interview was held at the 5th of June 2018 with an undisclosed member of the management team. The interview was not recorded, notes were made. Particular attention was made to quotes indicating business model innovation, resulting in 2 pages of interview details and quotes.

Newspapers

- Het Financieele Dagblad (2008 – 2017)
- Provinciaale Courant (2008 – 2017)
- Het Algemeen Dagblad (2008 – 2017)
- Africa News (2007 - 2018)
- The Herald (2007 - 2018)

Financial Data

- Data from the annual reports (2008 – 2017)

Other sources

- Press releases by firm B (2008 – 2017)
- Offshore Visie (2008 – 2017)
- Website of firm B
- Websites of customers

5.2.1 Introduction

The ancestors of firm B started in South America just after the 2nd world war as a small construction company. In the 80's firm B started fabrication of offshore constructions in Europe. During the 90's firm B grew towards a firm with multiple yards to produce these constructions. Firm B became capable of fulfilling complete engineering, production, commissioning and installation contracts. At the beginning of the new millennium, firm B acquired an engineering company in the USA. Firm B is a part of a group of companies, which has two main entities: firm B and the sister company which is a shipping company. The yards of firm B have their specific set of facilities which makes them suitable for certain type of constructions.

5.2.2 Organization

Figure 11- Organization of management in firm B

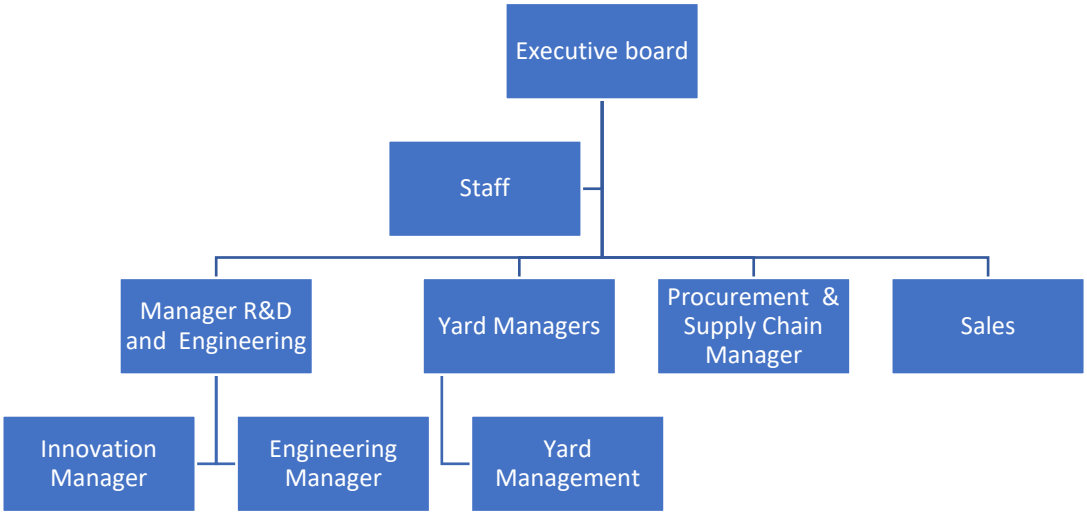
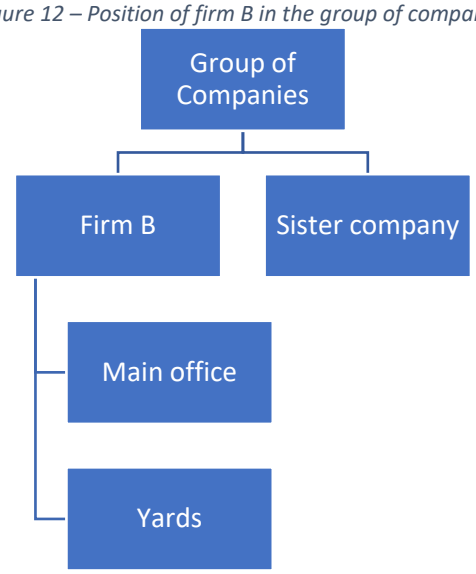


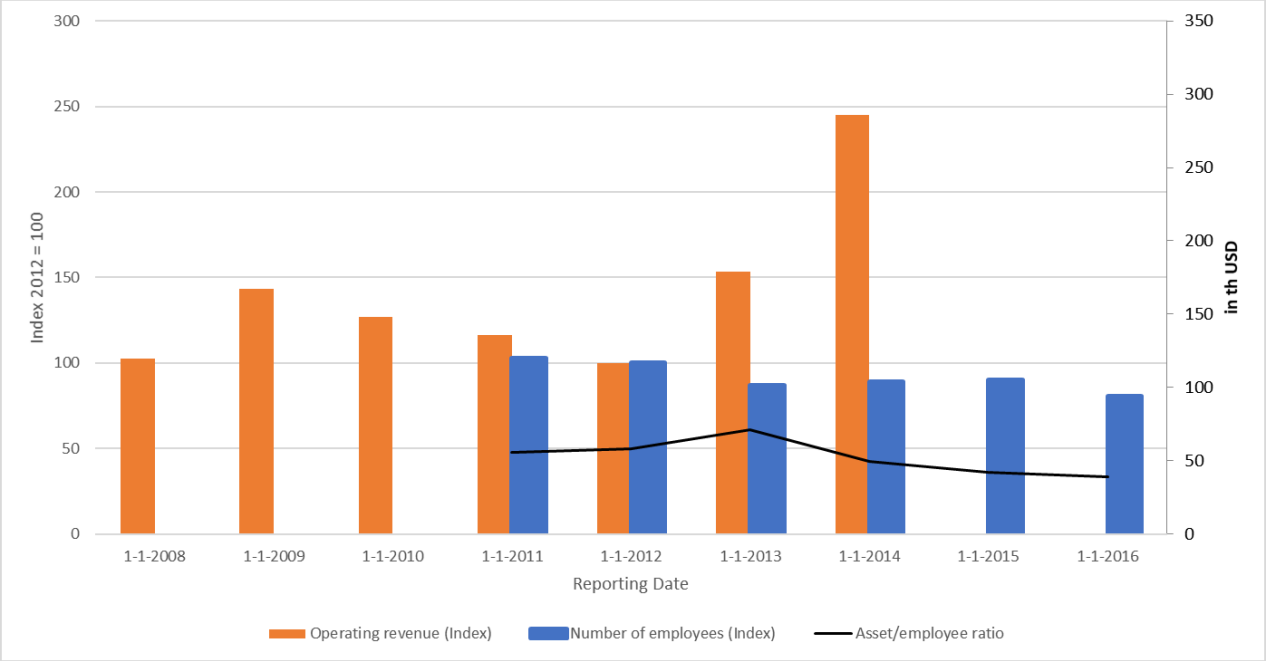
Figure 12 – Position of firm B in the group of companies



5.2.3 Results for the case of firm B

The number of employees and revenue for the period of 2008 – 2017 can be found in Graph 7. For anonymization purposes, indexes and ratios are used. The asset/employee ratio for 2008 - 2010 could not be retrieved since the data of the assets for that time could not be confirmed. Revenue data of 2015, 2016 and 2017 was not released.

Graph 7- Revenue, employees and tangible asset/employee ratio for firm B, source: annual report



5.2.4 Within case analysis

Considering the indicators for renewal or replication, a distinction can be made between replication or renewal for each of the business model levers and thus the business model. In the table below, events relevant for the research question, distilled from primary and secondary data are displayed in a chronological order. For every event is shown what lever of business model innovation was used and if it was used for replication or renewal. The driver for business model innovation is determined and an explanation is given for the determination. Impact on the business model is scaled from low to high in five steps and was checked during the interviews.

Table 13 – Events of business model innovation for firm B

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
1. Contract for windfarm industry.	T, M, O Co		Customer	Around 2008, firm B receives the order to build the first offshore transformation station with a new mayor European customer. With this contract firm B successfully enters the market of offshore wind energy (Algemeen Dagblad, 2009). The contract was set-up as a joint venture between a mayor industrial conglomerate and firm B. It was the *first* contract to enter the windfarm industry, which was made possible by a joint venture with a *new partner* and a *new customer*. This is a *new organization, which needs new management practices*.	Medium-High
2. Focus on EPCI contracts.	M, O		Strategy	Firm B decided to explore other markets and starts focusing on the engineering of complex EPCI projects (Offshore Visie, 2008). If a	Medium-Low

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				contract becomes an EPCI or another contract does not really change the way of approach for firm B. But a true EPCI contract involves the installation of the construction with help from the sister company. Both firm B and the sister company can have a competitive advantage by approaching the market together (Interview firm B, 2018). By deciding to focus on EPCI contracts, firm B tries to find customers at the higher end of the market by providing an all-inclusive package. By doing so, the sales organization *changes* and management sets *new* goals.	
3. Changes in the engineering organization.	M, O		Strategy	Around 2008, firm B hired an engineering manager and approximately one year later firm B established a separate entity for the engineering orders. The idea behind this is	Medium

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				concentrating the engineering resources near the headquarters in order to serve the European and Scandinavian market (Press release, 2018). Then firm B reduced the labour in the US subsidiary and let go of 100 employees (Financieele Dagblad, 2009). Firm B wishes to explore the market for engineering contracts, by hiring a specific manager, management *changes considerably*. In one continues action, then the knowledge of engineering is moved from the USA to Western Europe. Which is *a change* in the organization.	
4. Self-installing construction.	T, Co	O	Customer	Around 2010 firm B produced a construction which is capable of placing itself on the seabed. The construction was one of the largest possible for firm B, due to absence of larger facilities (Provinciaale Courant, 2012). The	Medium

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				design of this *new* technology was achieved together with two engineering partners. A construction with *new* technology, made possible by *co-creation with several other companies*.	
5. Sale of engineering entity.	O		Strategy	A deal was closed with a known engineering company to transfer the engineering activities of firm B in the USA, to the known partner (Press release, 2010). This disinvestment of engineering activities is a *change* in the organization.	Medium-Low
6. Quitting Africa.	O		Strategy	The firm decided to pull out of Western Africa, since there was no equal level playing field(Africa News, 2010). By pulling out of West Africa, firm B *changes* the organization. So far firm B failed to acquire solid results in Africa, the impact is therefore limited.	Medium-Low

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
7. Largest ever construction.		T	Customer	Around 2010, the *largest* construction ever build by firm B was delivered to the customer, pushing the boundaries for production technology (Press release, 2010). An *improvement* of the current capabilities of firm B.	Medium-Low
8. Again, largest construction.		T	Customer	Once again, firm B pushes the boundaries for the size of construction, but this time on a different yard and a different kind of construction. The size of the construction is the largest possible, since there are no larger ships available in the world to install the construction in its final position (Provinciaale Courant, 2012). An *improvement* of the current capabilities of firm B.	Medium-Low
9. Offshore transformation station.	O, Co	T, M	Customer	Around 2012, firm B receives two orders to build an offshore transformation station. This is the *same* type of product as previously	Medium-High

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				produced in 2008. This time firm B *teams up* with two other mayor technology concerns to build the construction which will be installed by the sister company. Customer for the station is *new* to firm B, the stations will be installed in the North Sea and firm B will subcontract a large part of the work to other parties (Het Financieele Dagblad, 2012; Het Financieele Dagblad, 2013; Press release, 2012;).	
10. Largest ever.	T, Co	O	Customer	One year later, a major subcontractor of firm B received the order for the detailed engineering of a new construction. The largest so far ever produced by firm B. The subcontractor and firm B have worked together before on other contracts (Press Release, 2013; Provinciaale Courant, 2016). The product includes several *new* technologies which need to be	Medium

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				developed. In 2015 the product was delivered.	
11. A construction for Western Africa.	T, M, O, Co		Customer	Around 2013, firm B was awarded a contract for a customer in Western Africa. While firm B acts as main contractor, a large part of the engineering work will be done by firms known to firm B since firm B sold her engineering part in the USA to this company. The transport and installation was subcontracted to the sister company. The product is to be delivered in Western Africa and includes *local produced equipment*, as *requested by the customer*. A contract for a geographically *new* location: Africa. The contract is managed by firm B, which includes engineering by *several* subcontractors and the production on *several locations*. This needs a *new* type of	Medium-High

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				organization and management.	
12. New CEO and CFO.	M		Strategy	Around 2014, the owners of firm B appointed a *new* CEO and a *new* CFO (Press release). The CEO is *new* to the industry. He has experience in mining. The appointment of the new CEO introduces *new management practices*, since he is new to the industry.	High
13. New factory.	T, O		Strategy	In the same year, firm B announces the opening of a new factory in Northern Europe. The factory will be responsible for the fabrication of smaller, complex parts of the steel construction. Firm B used to subcontract those smaller parts to several other companies. By opening a fabrication facility firm B wants to achieve constant high quality of the parts delivered at a competitive price (Press release, 2014). By opening a factory	Medium

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				in Poland, firm B *acquires* the technology to build previously subcontracted parts. This has also implications for the *organization*.	
14. Quitting windfarm industry.	M, Co		Strategy	Around 2014 firm B announced that it will not further explore opportunities in the windfarm industry. The needs for these specific customers were not clear, making the risks within this business too big. Firm B delivered already two stations for Norther European customers, but it was still unclear whether these stations fit customers' demand (Het Financieele Dagblad, 2014). In reality firm B did not entirely abandon the windfarm industry. The problem was that the risks involved were too high and that mayor industrial players forced firm B to take too much risk compared to the revenue and profit firm B gets. With this	Medium-High

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				statement firm B tries to *change* the business model as it is into a more profitable one. Firm B tries to do so by *changing* the interaction between the parties involved. In the meantime, firm B always remained interested in working for the windfarm industry but only at acceptable risk. Meaning that developed technology remains in house available (Interview firm B, 2018).	
15. Centre of innovation.	M, O	T	Strategy	Firm B opens a new innovation centre near the headquarters. The goal of the innovation centre is to remain the market leader for offshore constructions in the future. Firm B wants to achieve this by opening up the innovation centre and by doing so attracting young and talented engineers to work on cutting edge technology, mainly to be used in the	Medium

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				production of the constructions. The first innovation achieved is a welding robot, which was co-developed with a welding automation specialist. Once the innovation centre was opened firm B was able to focus the innovation process, being mainly product and process *improvement* (Het Algemeen Dagblad, 2015; Interview firm B, 2018; Press release, 2015).	
16. Electric link.		T, M, O, Co	Customer	Around 2016 firm B was awarded the contract for the construction of an electric link for offshore wind farms. The engineering however was done by the customer, making firm B only responsible for the construction (Press release). The CEO explains that ”For firm B it would be a *continuation* of the strong and pleasant relationship with our partners”, making the order a *repeat* order for this type of	Medium-Low

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				construction and customer.	
17. Construction for Northern Europe.	T, Co		Customer	Again around 2016 firm B got the contract for a large offshore construction for Norther Europe. The construction was developed together with the customer (Press release, 2017). A *new* product for the Northern European market, developed *together with the customer* makes this renewal on technology and co-creation.	Medium
18. Repeat order.		T, O, Co	Customer	In the same year firm B acquired another contract from a known customer. Once again, the customer will take care of the engineering and procurement. The production will take place at one of the yards of firm B (Press release, 2016).Once again a *repeat* order from a *known* customer.	Low

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
19. Reorganization.	M, O		Strategy	In August of the same year firm B announces that it encounters strong competition in a difficult market. Management decided to reorganise firm B dramatically, including the overhead departments such as purchasing and engineering. Nearly 60% of the employees were made redundant. All *managers were moved* to another position within firm B or made redundant "Only the CFO, CEO and COO did not change position" (Interview firm B, 2018). Company *culture* changed from an improvising production approach to a more planned production approach, making the production process much more efficient. Piping fabrication and assembly process was completely outsourced. Every employee was told by the CFO and CEO, in a	High

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				special course, what the *new firm B* will look like. The need for product and process innovation is *pushed by management*, mainly with help of the innovation centre. (Algemeen Dagblad, 2016; Het Financieele Dagblad, 2016; Interview firm B, 2018; Press release; Provinciaale Courant, 2016;).	
20. MOU with competitor.	M, O, Co		Strategy	At the end of the year firm B announces a memorandum of understanding, signed with a competitor. Firm B and the competitor will *jointly* offer construction development to potential customers. The engineering expertise and the market penetration of the competitor will be used, together with the know-how of firm B. Since both firms have the same customers, the firms *change* their market approach, providing better integrated solutions towards	Medium

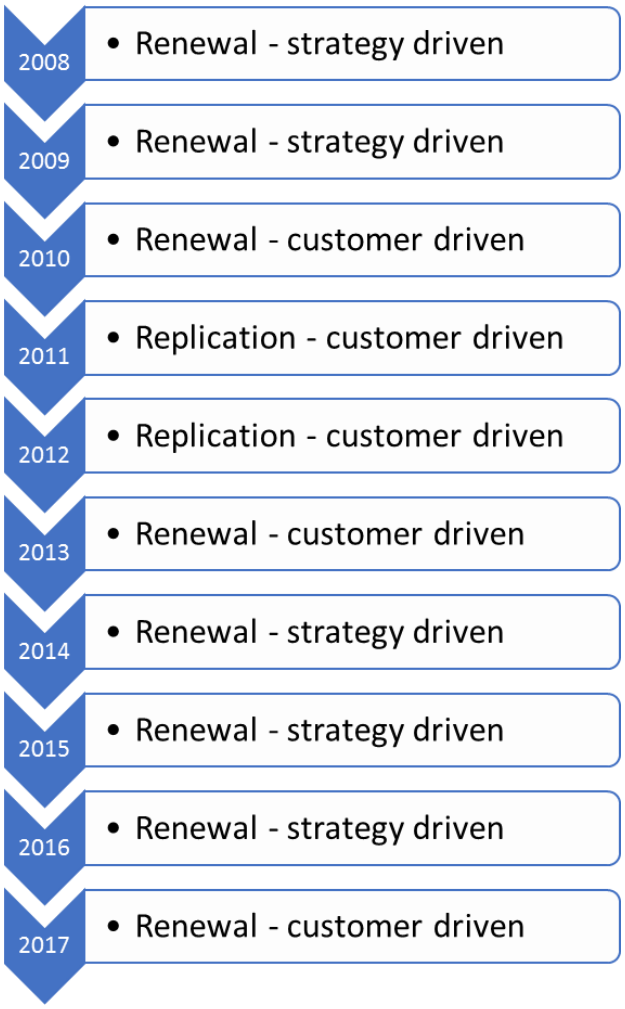
Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				customers. By combining the strengths of two companies, a *new cooperation* is achieved which is able to develop *new solutions* for customers. *"If you can't beat them, join them"* (Interview firm B, 2018; Press release, 2016; The Herald, 2016;).	
21. Offshore construction for known customer.		T, O, Co	Customer	Around 2017, firm B was awarded a contract by a *known customer* for an offshore construction. The main technology will be new for firm B, but delivered by the customer. The customer has the contract with the end-user.	Medium
22. FEED contract.	T, Co		Customer	In the same year, a contract for front end engineering and design was given to firm B by a *new* customer. New is that all costs involved in the design phase will be deferred until the customer starts making money with the product supplied.	Medium

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				The plan for this construction is to adapt an existing construction for the *new* purpose. The costs to make this feasibility study are completely for firm B, making this project a cooperation between firm B and the new customer, with the main risks for firm B. This is a *different* contracting approach for a new customer. (Press release, 2017).	

5.2.4.1 Timeline on business model transformation

Below timeline shows the mayor type of business model innovation in chronological order.

Figure 13 - Timeline of business model transformation by firm B



5.2.4.2 Enablers and inhibitors of business model innovation for firm B

During the interview, several factors that inhibit or enable business model innovation were elaborated.

With the appointment of the new CEO and CFO, *the type of leadership* has recently changed towards a more transformational type (Interview firm B, 2018).

The organizational identity is under pressure. What was normal in the past is now deliberately being challenged by management. Firm B is specialist in large offshore constructions for Europe. The engineering, procurement and production processes are fully aligned to deliver such large constructions. The problem is that the new requests made by customers consist of smaller constructions. The main reason is the remaining low oil prices that forces customers to think more short-term. Management is deliberately challenging the organizational identity in an attempt to make the firm more agile and flexible. The old firm B is not the future of firm B (Interview firm B, 2018).

The new CEO and CFO are in their position since approximately 2012, a relatively short period (Interview firm B, 2018).

The absorptive capacity of firm B can be considered as average. It took a long time before firm B was able to build repetitive orders for the windfarm industry. This was, amongst others, caused by the inability to understand the new industry (Interview firm B, 2018).

The customer is an important voice for the firm B organization. Often customers are the same, or have a mutual background. The long term relationship with these "oil mayors" makes it hard to change toward windfarm industry (Interview firm B, 2018).

Internal cooperation is average. The firms' organization is relatively clear. There are four locations with their known tasks. Within these locations the cooperation is good; cooperation between the various locations however is difficult (Interview firm B, 2018).

The size of the organization of firm B is *decreasing*. Therefore the changes to the organization will not be influenced by tendency to replicate during growth (Interview firm B, 2018).

In general *corporate governance* is long term and not influenced by shareholders short term focus. Firm B is family owned and has one main shareholder with a strategy for multiple years (Interview firm B, 2018).

New laws and regulation made it possible for firm B to enter the windfarm market with co-creation (Interview firm B, 2018).

Capital intensity does influence the ability to innovate the business model. It is not clear if management of firm B had the intention to sell the yards, but it did not do so for two main reasons. First of all, one did not anticipate a buyer on short term since the yards are specifically made for heavy steel constructions for the oil and gas industry. Since requests now consist of smaller constructions, it was anticipated that the price for the yards would be likewise low. Secondly there was a strong intention to start all yards as soon as orders would be coming in again (Interview firm B, 2018).

5.2.4.3 *Summary of analysis*

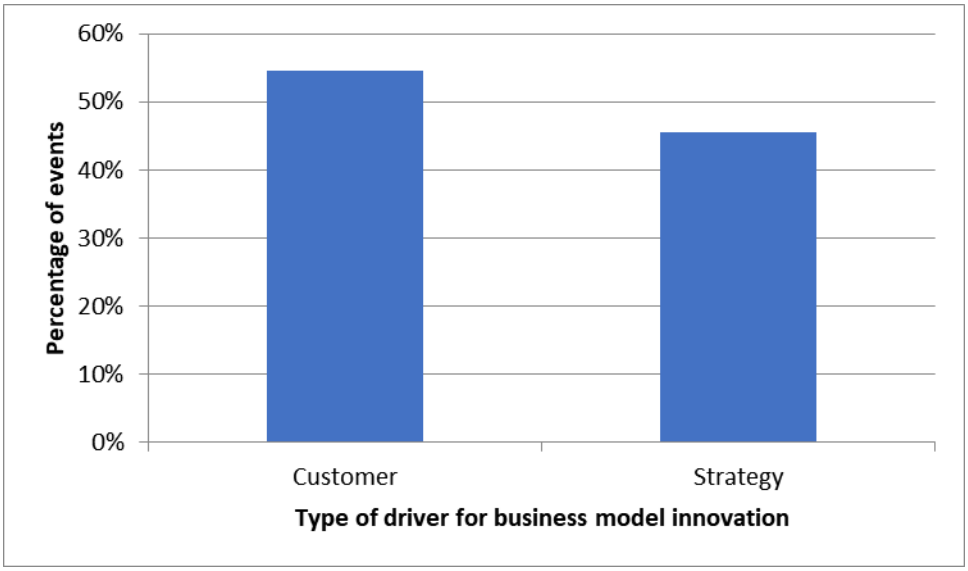
In the following section, the analysis is summarized into five important observations. These findings show the main driver of business model innovation for firm B, which levers were used and the role of management in business model innovation.

Table 14 – Main observations from the case study for firm B

- Uses both customer driven and strategy driven business model innovation.
- Mainly uses the co-creation and technology levers.
- Strategy driven renewal is focussed on management and organization.
- Uses often only one lever.
- Moved from strategy driven renewal, to replication, to customer driven replication and back to customer driven renewal.

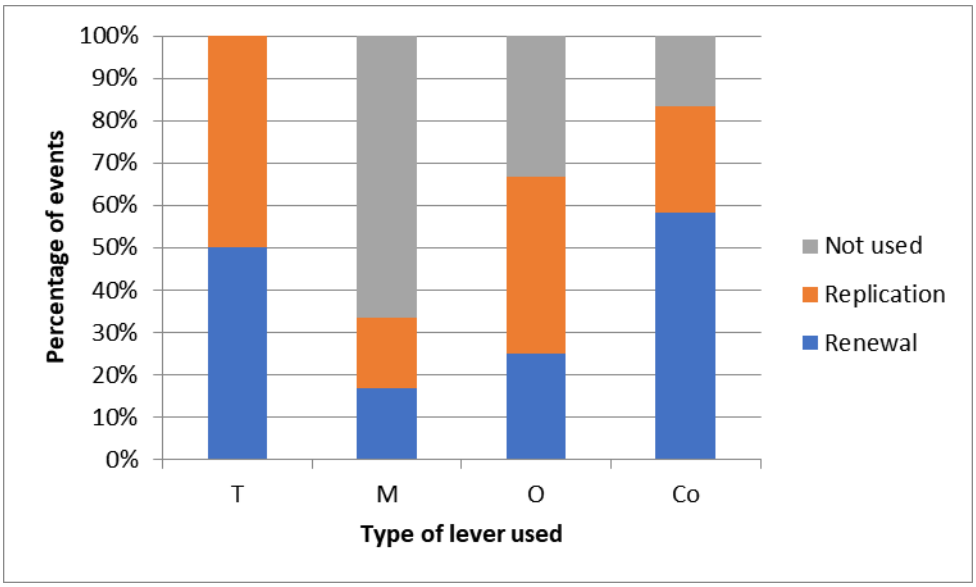
In the following chapter, the analysis is summarized into five important observations.

Graph 8- Observation 1: Customer or strategy driven renewal



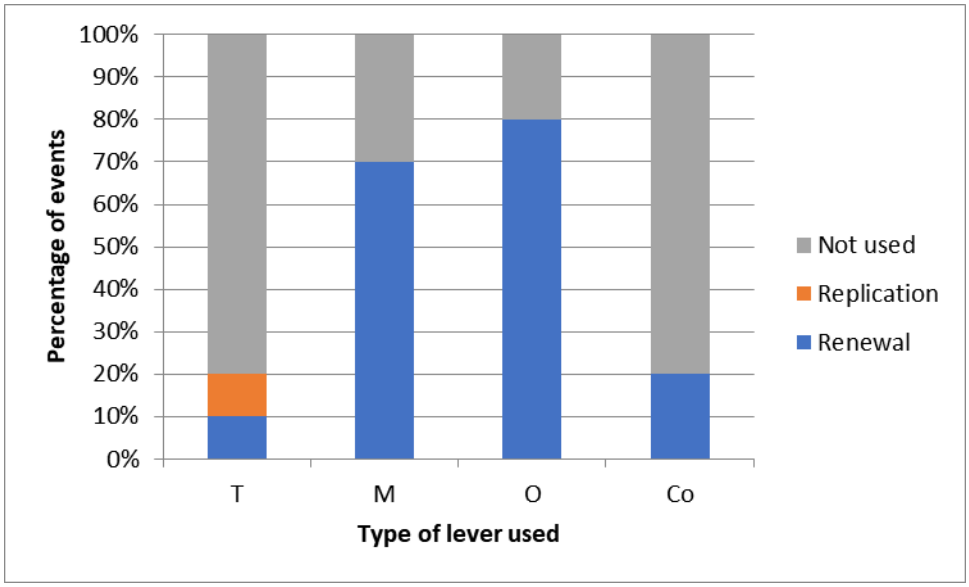
The first observation is that firm B mainly changes the business model driven by customer. As shown in Graph 8, 55% of the events is customer driven and 45% is strategy driven.

Graph 9 – Observation 2: The role of the levers for customer driven innovation: replication or renewal



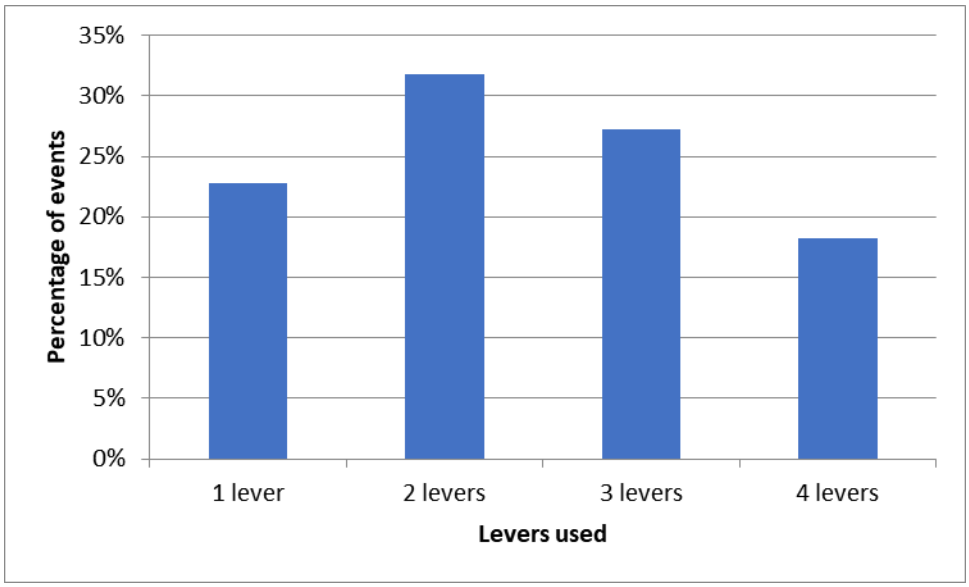
Second, if firm B endeavours customer driven renewal, the main levers used are technology and co-creation. Organization is used as well, but management is barely used as shown in Graph 9.

Graph 10 – Observation 3: The role of the levers for strategy driven innovation: replication or renewal



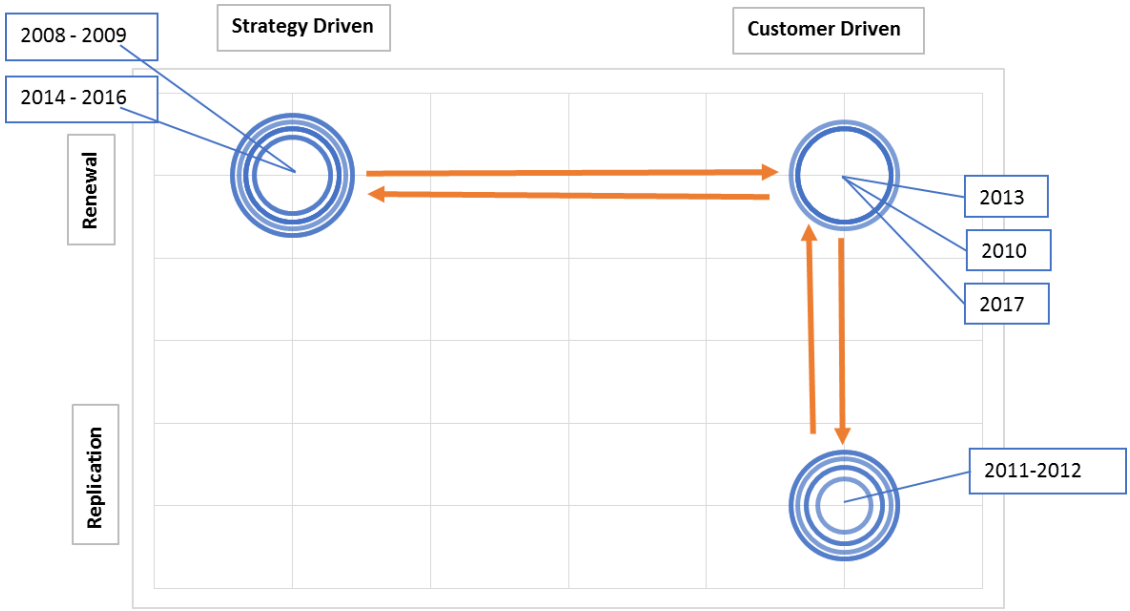
Third, when strategy driven innovation occurs, firm B focusses on management and organization. For this type of change, firm B barely uses more than three levers at the same time.

Graph 11 – Observation 4: Number of levers used



The fourth observation is that firm B uses often only one lever. Two, three and four levers are used at respectively 32%, 27% and 18% of the events.

Figure 14 – Observation 5: Business model innovation matrix of firm B



Fifth and final, an analysis is made on the business model transformation process. In Figure 14 the chronological steps taken by firm B for transforming the business model are shown. All events are taken into account and the size of the rings show the impact on the business model. Firm B did not use strategy driven replication in a relevant way for this study. Therefore the business model innovation matrix shows that firm B used three out of four types of innovation and thus no strategy driven replication. Firm B moved from strategy driven renewal, to customer driven renewal, to customer driven replication and back to customer driven renewal. The business model continues in this oscillating process with several business models in operation at the same time.

5.2.5 Discussion and implications for the case of firm B

Firm B changes their business model in a dual way. Time after time, firm B receives a repeat order, thus replicating the business model. But the change of management in 2013 clearly initiated a period of strategy driven renewal. At the same time however, firm B is still building repeat orders for current customers. Firm B is oscillating between different types of business model innovation, with overlap in the transformation process.

The oil and financial crisis clearly initiated a “Schumpetarian shock” (Schumpeter & Opie, 1934) for the industry and in particular firm B. Before the crisis struck firm B, the focus was on record breaking bigger constructions time after time. In 2014 this resulted in record breaking revenues and profit for firm B. Yet however, these same customers stopped ordering after 2014. This in combination with the failure to enter the windfarm market in time indicates that management of firm B was unable or unwilling to explore other opportunities in time and allocate sufficient resources to do so. The change of management in 2013 was too late to prevent a dramatic reorganization, but apparently in time to save the firm from further decline.

At this time firm B is competing against disruption in the sector. Several smaller and more agile firms compete with firm B for smaller contracts. The competition is tough and the time that firm B acts as main contractor towards the end-user appears to be over. Customers now talk with the technology provider for the windfarm industry, which is not firm B. Firm B fails to acquire customers from the high-end market and is being disrupted by low-end competition. The need for change of the business model therefore remains.

5.3 Case study firm C

In this chapter, the results of the research and interview with management of firm C are presented. Data from the research is analysed by determining which levers were used and how. Were the levers replicated or renewed? The driver for business model innovation is determined and also the impact on the business model. The determination is explained by the use of clear data or quotes from the interview. Subsequently the inhibitors and enablers for firm C are further elaborated. This chapter ends with a thorough within-case-analysis on how firm C uses the levers for business model innovation and the role of management.

Table 15 – Data sources for the case of firm C

Interview

- A two hour interview held at the 16th of July 2018 with undisclosed member of the management team. The interview was not recorded and notes were made. Particular attention was made to quotes indicating business model innovation, resulting in 2 pages of interview details and quotes.

Newspapers

- Het Financieele Dagblad (2007 – 2018)
- Het Algemeen Dagblad (2007 – 2018)
- Het Parool (2007 – 2018)
- The Times (2010 - 2018)

Financial Data

- Data from the annual reports (2008 – 2017)

Other sources

- Press releases by the firm (2007 – 2018)
- Website of the firm
- Executive appointments monitor (2010 - 2018)

5.3.1 Introduction

Firm C is a superyacht builder in Western Europe. Firm C started the production of ships in the 1980's, while being assisted by another firm. After using several other shipyards, firm C is since the 90's located in their current yard. The first order in the new yard was immediately the largest yacht ever build at that time for the firm. For the design of the yachts firm C uses often a designer studio, which is a part of the firm C group of companies.

Around the millennium, firm C was at the edge of bankruptcy. News articles stated that firm C was not paying salaries of their workers anymore, which caused unrest. In reality however, firm C continued paying their workers. After solving the cash flow issues, firm C continued to work on the largest yachts in the world. However in a very discrete, secret way. They continued working the way they started the firm: subcontracting the hull to a different yard and outfit the hull on the own yard.

5.3.2 Organization

Figure 15 – Organization of management in firm C in 2017

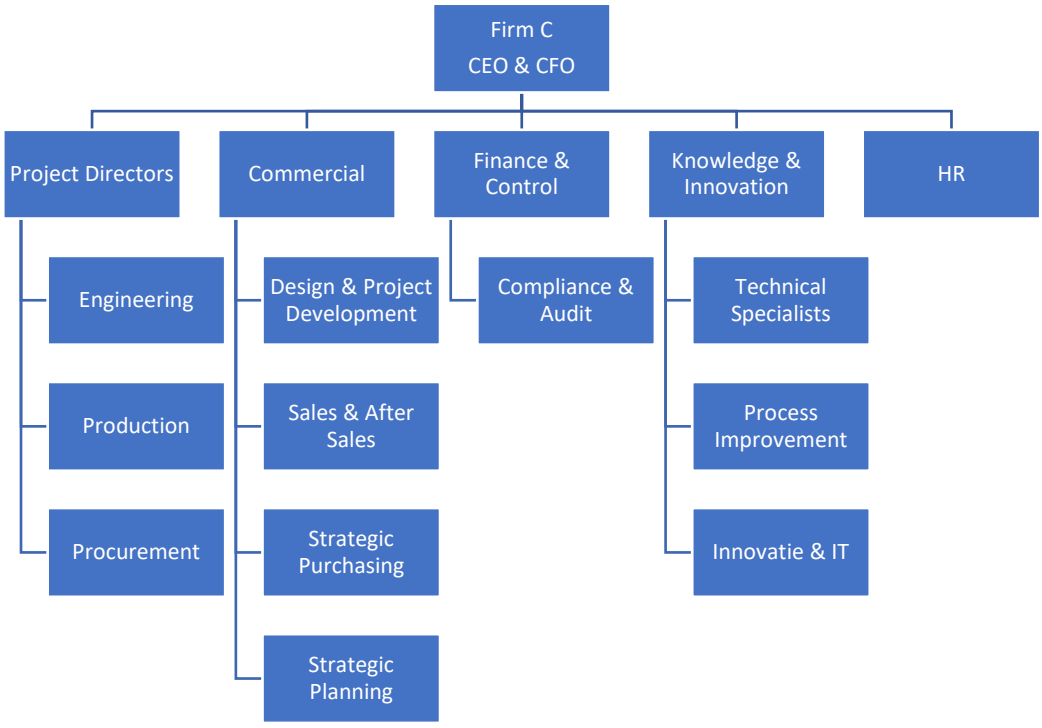
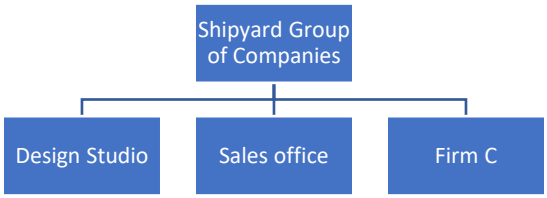


Figure 16 – Position in the shipyard group of companies

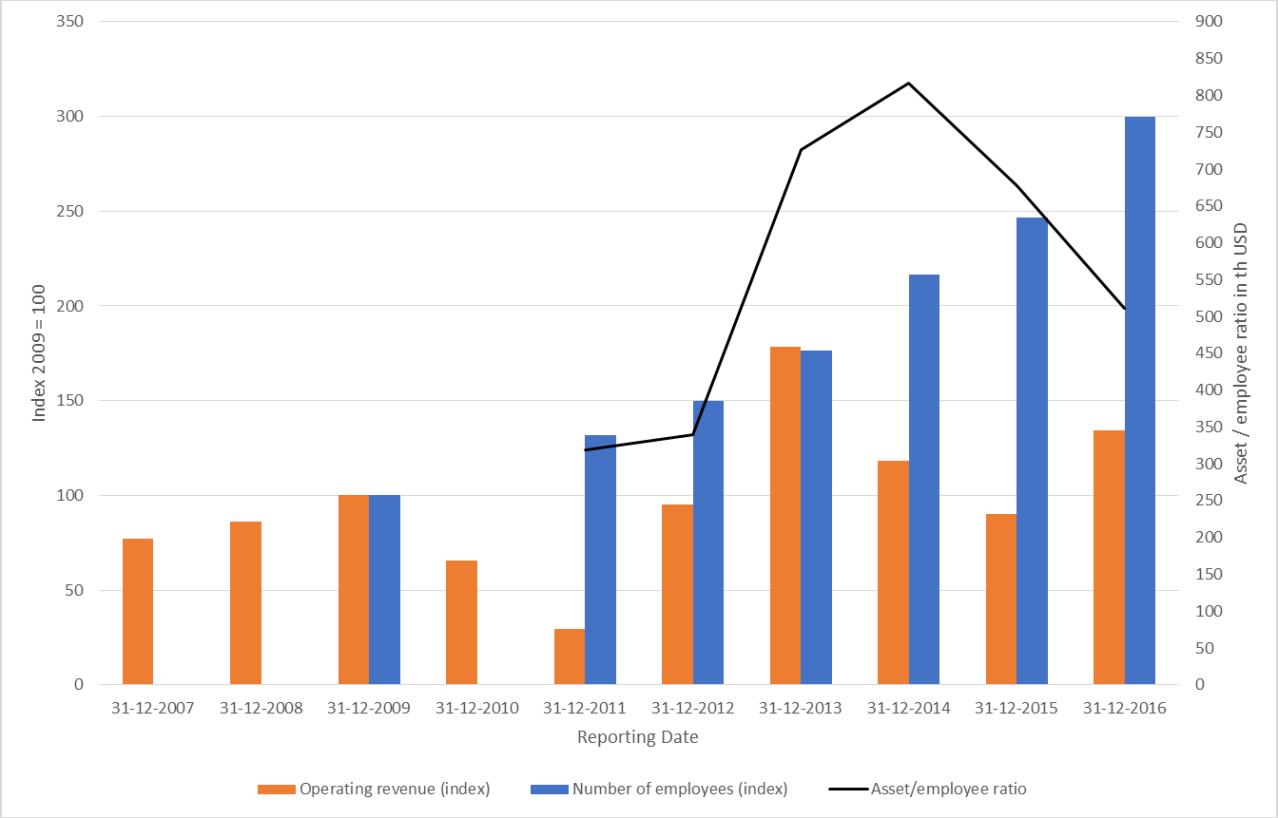


5.3.3 Results for the case of firm C

The number of employees and revenue for the period of 2008 – 2017 can be found in Graph 12. For anonymization purposes, indexes and ratios are used. The asset/employee ratio for 2007 – 2010 could not be retrieved since the data of the employees for that time could not be confirmed.

According to firm C it did not sell any ship in 2008, 2009 and 2010 (Het Algemeen Dagblad, 2014). Data for 2017 was not available.

Graph 12 - Revenue, employees and tangible asset/employee ratio of firm C, source: annual report



5.3.4 Within case analysis

Considering the indicators for renewal or replication, a distinction can be made between replication or renewal for each of the business model levers and thus the business model. In the table below, events relevant for the research question, distilled from primary and secondary data are displayed in a chronological order. For every event is shown what lever of business model innovation was used and if it was used for renewal or replication. The driver for business model innovation is determined and an explanation is given for the determination. Impact on the business model is scaled from low to high in five steps and was checked during the interviews.

Table 16- Events of Business model innovation for firm C

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
1. Around 2009, firm C delivered the 3rd semi-custom yacht in a row		T, M, O, Co	Customer	Developing and building the 3rd *semi-custom* yacht in a *row* involves replication on all four levers.	Medium-Low
2. Change of ownership	M		Strategy	A year later it was announced that the ownership of firm C will be transferred to a new owner who is private investor. The new owner also decided to change the CEO. This initiated a change in management style, the new owner is leading the firm in a more transformational style of leadership, with high expectations from the board of directors. The change of owner resulted in a new course. Where the old owner focused more on semi-custom vessels, the new course for firm C would become full custom and even bigger yachts (Interview firm C, 2018)	Medium-High
3. Appointment of the Design Projects and R&D Manager	M, O, Co		Strategy	The new owner decides to improve the approach towards sales by setting new targets for the designs and even setting up a special unit to develop these *new* products. A manager was appointed around 2010 to lead this *new* organization with *new* tasks (Executive Appointments Monitor, 2010). The appointment of a specific manager for the	Medium-High

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				design, research and development was a strategic decision. Within this new design process, the customer has a strong influence. Products are designed with the customer in a co-creation process where everything can be discussed "up to the direction of rotation of the interior doors" (Interview firm C, 2018).	
4. The construction of larger production facilities to accommodate new designs	T		Strategy	Firm C's owner announced that they will invest more in the shipyard and want to double the production and the number of employees. The investment is valued at 80 million euro (Het Financieele Dagblad, 2012). In 2012, firm C started the construction of a *2nd production hall and dry-dock at the yard* (Het Algemeen Dagblad, 2012; Het Financieele Dagblad, 2012) The complete plan consists of one new shed and one new covered dry- dock which can accommodate *larger* vessels (Press release, 2012).	High
5. Cooperation with customers, suppliers and employees	O, Co		Strategy	By proclaiming the biggest achievement of firm C the cooperation between parties, the new CEO clearly points out that this was a goal for firm C and part of the new course introduced by the new	Medium

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				owner and the CEO (Press release, 2012)	
6. Hiring personnel abroad		M, O	Strategy	Due to the lack of available qualified personnel, firm C starts to hire personnel with the same qualifications abroad. To fulfil the growing demand for their products, firm C needs *more personnel*. Around 2013, management decided to start recruiting personnel abroad, main focus on Germany and Austria (Het Financieele Dagblad, 2013).	Low
7. Exclusive supplier of hull construction opens up 2nd production facility		T, Co	Strategy	Due to the high load on the yard, capacity increase is necessary. The supplier opens a *2nd* production facility which can accommodate the workload. The relationship between Firm C and the supplier changes, resulting in a *capacity increase* for both parties (Het Algemeen Dagblad, 2013).	Medium
8. Firm C world leader.		M	Strategy	By proclaiming the target of Firm C becoming world leader, the new owner sets a next step for management to work on (The Times, 2013).	Medium - Low
9. First Code compliant yacht	T, Co	M	Strategy	By deliberately developing and start building a *new* to the world yacht, *new* capabilities are acquired by firm C. This yacht was already under development even before the code became effective. The vessel was	Medium - High

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				designed and build together with the suppliers, since this was new for the yard and suppliers. The vessel was delivered by around 2014 (Press release, 2014; Interview firm C, 2018).	
10. Yard logistics subcontracted	T, O	Co	Strategy	The sole reason to subcontract yard logistics is to improve the current logistics. Firm C does so by opening up the organization to a subcontractor and making them part of the organization. The subcontractor will arrange all the yard internal logistics, from warehouse to ship. The subcontractor will make use of their own technology and knowledge and integrate this with the processes of the firm. The subcontractor and firm C know each other already for a long time (Press release, 2015; Interview firm C, 2018).	Low
11. Delivery of a semi-custom yacht.		T, M, O, Co	Customer	Around 2015 a semi-custom yacht was delivered. The development, construction and delivery of a semi-custom yacht involves replication on all four levers since much of the activities will be a *repeat of previous produced products.*	Medium - Low
12. Sailing yacht	T, O, Co		Customer	A very innovative ship, build at *customer request*. A new landmark in the *innovative*	Medium-High

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				open approach of firm C, where both partners within this project are respected for their expertise in their field of knowledge (Press release, 2015; Interview firm C, 2018)	
13. 2nd sailing yacht	T, O, Co		Customer	A year later, firm C revealed its latest innovative product. Once again a very innovative sailing yacht, but for a different customer, with different co-developers and different technology. The ship is a result of the *cooperation* between Firm C and a designer studio (Press release, 2016; Interview firm C, 2018).	Medium-High
14. Superyacht	T	Co	Customer	Around 2017 firm C once again pushes the boundaries. This product is the largest, full custom yacht ever produced by the firm. The customer is *known* to the firm, which is a replication on co-creation (Press release, 2017; Interview firm C, 2018)	Medium-High
15. Current reorganization	M, O, Co		Strategy	The main reason for the current reorganization is a necessary change an all existing levers. The growth encountered last years made the project oriented organization *hard to control*. The inflow of new talent makes the experience within the firm relative small, this causes employees to *not*	Medium - High

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				know exactly how things are done and what the *strength of firm C* is. Communication goes to much vertical instead of horizontal in the organization, which causes *inefficiency*. The projects should become back in control, now the departments are too much in control. To do so, teams are build up in *multidisciplinary* way. Jobs are organized in zones instead of disciplines. Suppliers are invited to take part of discussions with the customer. Previous team leaders of the respected disciplines are now organized in a knowledge and innovation centre, instead of being part of the project. They thus have a more advisory role and not a decisive role and are asked *to think ahead and prevent faults to happen*. While in the past the suppliers were evaluated based on compliancy with specifications and their pricing, Firm C is now implementing *"best value procurement"* which is based on functional descriptions and leaving room for suppliers to come up with innovative ideas. On a higher level, Firm C tries to change *the company culture* towards	

Event of business model innovation	Levers renewed	Levers replicated	Driver of business model innovation	Rationale	Impact on business model
				a more entrepreneurial, self-confident and responsible culture. At this moment, too often things “just happen” and although the problems are solved, people do not feel responsible to change the cause of the problem (Interview firm C, 2018)	

5.3.4.1 *Timeline on business model transformation*

Below timeline shows the type of business model innovation in chronological order.

Figure 17 - Timeline of business model transformation by firm C

5.3.4.2 Enablers and inhibitors of business model innovation for firm C

During the interview, several factors that inhibit or enable business model innovation were elaborated.

The *type of leadership* encountered in the management team of firm C can be described as transformational. There is a clear vision and intellectual stimulation of the management team (Interview firm C, 2018).

The *organizational identity* is under pressure. At this moment it is felt that too many new people, new suppliers and products cause the organization to lose its norms and believes. This makes the organization inefficient in delivering the projects. That is why Firm C is currently reorganizing (Interview firm C, 2018).

The *organizational culture* is described as *"impassioned and proud and too little make-it happen"* (Interview firm C, 2018). This indicates an organization that is not resilient in dealing with unexpected changes. The culture at firm C can thus be described as little innovative, contrary to the products they produce.

The new owner and *new CEO* are now in their position for approximately 8 years. Several other managers are in their position over 10 years and have experience in shipbuilding (Website; Press releases; Interview firm C, 2018).

The *absorptive capacity* of firm C is expected to be high. There is a clear strategy and culture of "proudly found somewhere else" which makes the organization very innovative (Interview firm C, 2018).

Firm C is balanced in the way they *listen to their customers*. Most of the products start with an idea made by firm C, which is later developed into a custom made product (Interview firm C, 2018).

Internal cooperation is very little. All current products are custom made, making internal knowledge sharing hard since context and technology will be different. There is a clear subcontracting strategy at Firm C, which makes that specific knowledge is deliberately held at subcontractors and not developed and shared in-house. Projects are managed in a strong project oriented organization, which inhibits knowledge sharing (Interview firm C, 2018).

Managing *organizational growth* is an actual challenge for firm C, but does not hinder them in renewal. This is caused by the project organization which enables every project director to decide as needed to deliver the project (Interview with firm C, 2018).

Corporate governance is long term and not influenced by shareholders short term focus. Firm C has one shareholder with a strategy for multiple years (Press release).

Compliance with laws and regulation influenced Firm C to innovate the first code compliant yacht (Press release; Interview firm C, 2018).

In the past *capital intensity* did influence Firm C on their ability to innovate the business model. With the previous owner there was a strategy of replication. The new owner renewed the business model and was, apparently, not hindered by the financial burdens to invest in technology. Within the new business model, asset utilization is still a point for discussion. The focus for firm C is however not on

the maximum utilization of their assets, but to deliver the products in time and at the right quality. To limit the risks spare time is taken into account for the occupation of the docks and sheds. This limits the risks for two projects in one time and assures a high quality product, delivered as requested (Interview firm C, 2018).

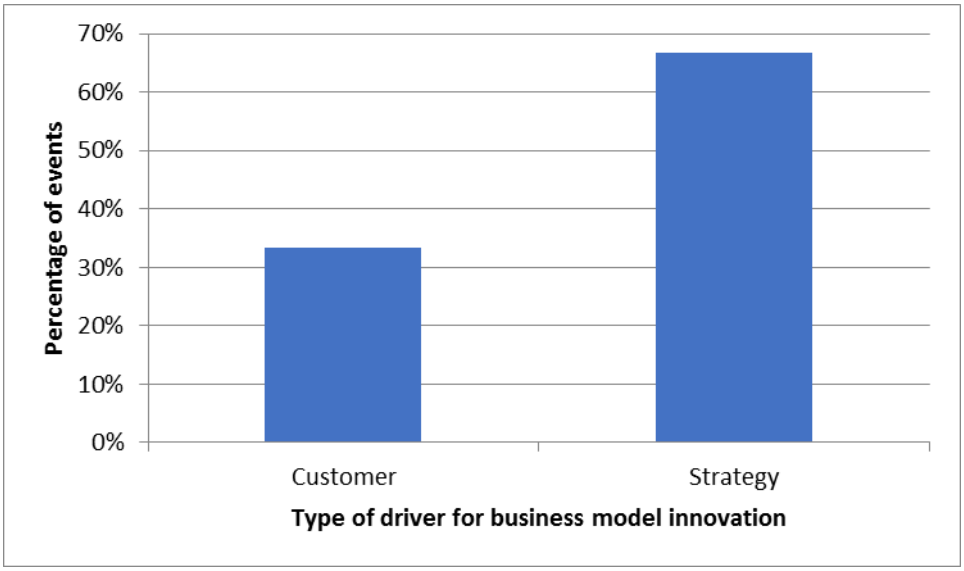
5.3.4.3 Summary of analysis

In the following section, the analysis is summarized into five important observations. These findings show the main driver of business model innovation for firm C, which levers were used and the role of management in business model innovation.

Table 17- Main observations from the case study for firm C

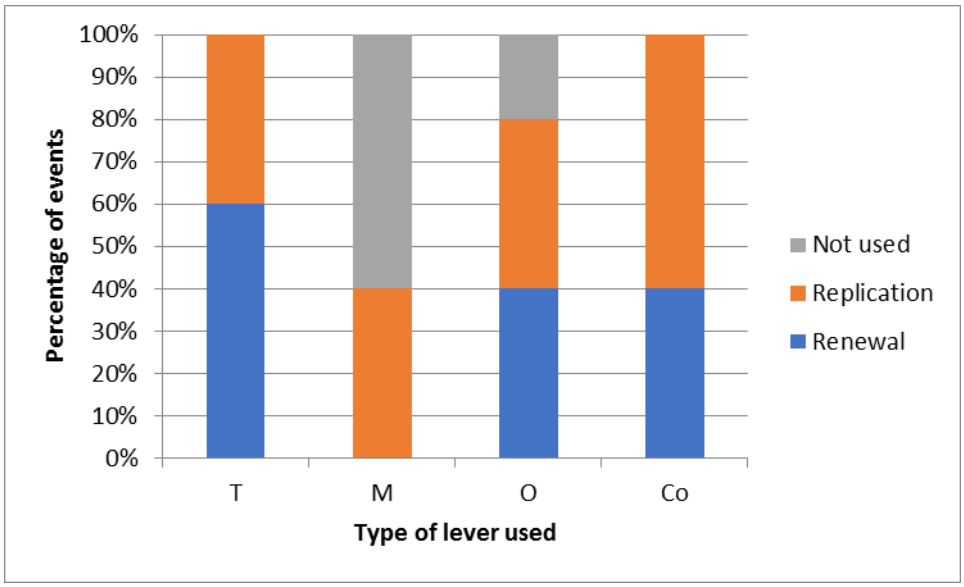
- Mainly uses strategy driven business model innovation.
- Uses all levers in different kind of combinations. Very often the technology and co-creation lever.
- Uses often strategy driven replication, recently with more impact on the business model.
- Moved from customer driven replication, to strategic renewal, to strategic replication and back to customer driven renewal.

Graph 13 – Customer or strategy driven innovation



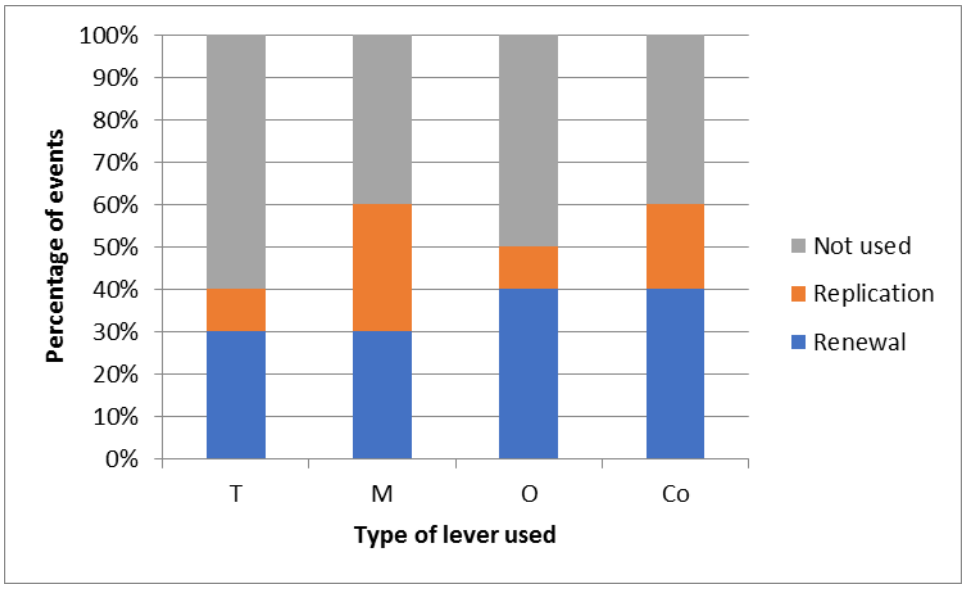
Graph 13 shows the distribution between customer and strategy driven business model innovation. In 67% of the events, Firm C is working on strategy driven changes. In only 33% of the events change is driven by the customer.

Graph 14 – The role of the levers for customer driven innovation: replication or renewal



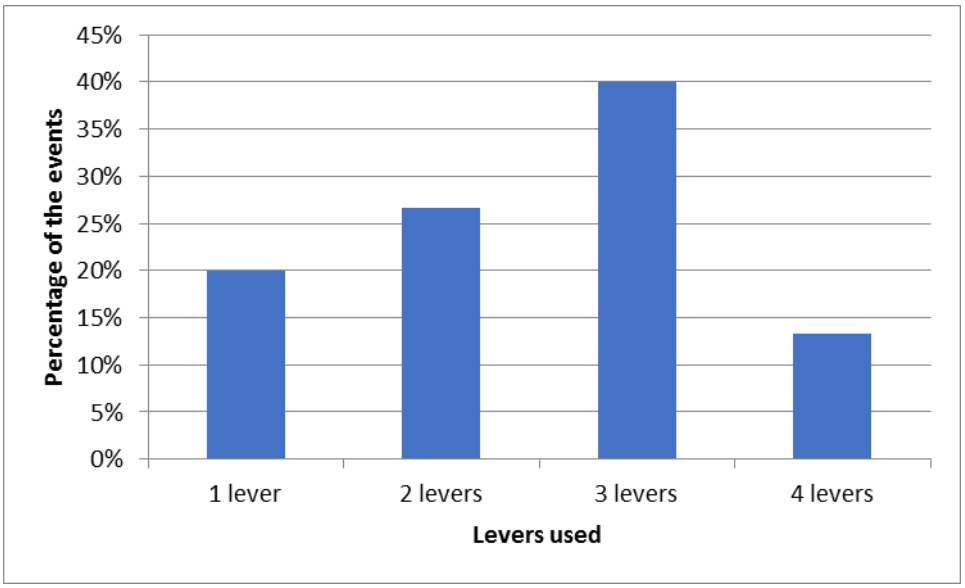
Secondly, if business model innovation is driven by the customer, 100% of the events the lever of technology and co-creation is used, as shown in Graph 14

Graph 15 – Observation 3: The role of the levers for strategy driven innovation: replication or renewal



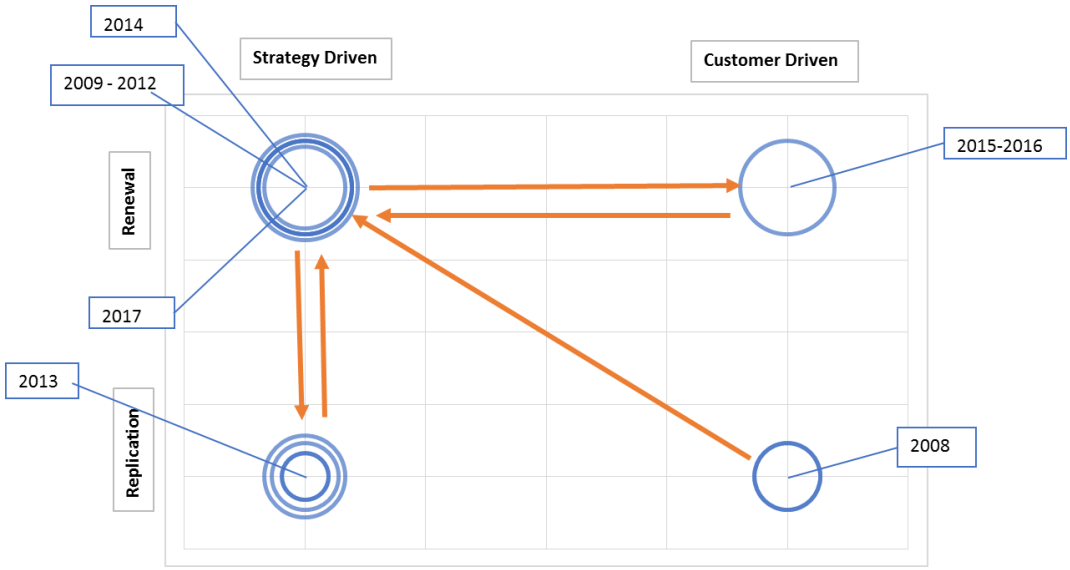
The third observation is that strategy driven business model shows no clear pattern. The results shown in Graph 15 show that all levers are used, sometimes combined and sometimes only one lever. Especially in the past only few levers were used, more recently several levers are used at the same time enhancing the impact of the improvements.

Graph 16 – Observation 4: Number of levers used



Fifth and final, firm C rarely uses four levers at the same event. As shown in Graph 16, only 13% of the events firm C uses all four levers to innovate the business model. One, two and three levers are used in respectively 20%, 27% and 40% of the events.

Figure 18- Observation 5: business model innovation matrix of firm C



Fourth, Firm C went through all four types of business model transformation. Figure 18 shows the chronological steps taken by firm C for transforming its business model.

5.3.5 Discussion and implications for the case of firm C

After the takeover by the new owner, firm C changed from a more replicating strategy towards renewal. In the last ten years technology, management, organization and co-making were renewed considerably. In the meantime firm C also improved the four levers, but with less impact.

Since the takeover, firm C went through several years of business model renewal pushed by the strategy of the new owner. In particular the appointment of a manger for the design projects and the investments in the yard made it possible for firm C to develop the products they recently delivered. These products are true custom build in co-creation with the customer and suppliers.

Firm C has a culture of “proudly found elsewhere”, they rely heavily on the capacity of the subcontractors and suppliers, which includes engineering. While developing radically new products, firm C continues to build semi-custom yachts. This limits the load on the engineering and design capacity, but assures a fully utilized yard. Firm C is thus able to maintain different types of business models at the same time. The business model of firm C is close to a “network model”(Volberda et al., 2017, p. 228), where the focal firm acts as a conductor of an orchestra consisting of the surrounding industry in terms of development and production. This model is typically used in high tech industries where the environment is changing rapidly and is highly competitive. Shipbuilding is a very traditional industry and it is therefore questionable if firm C is capable of reaping the rewards for the products it produces or if the subcontractors take most of the rewards.

6 Cross case analysis

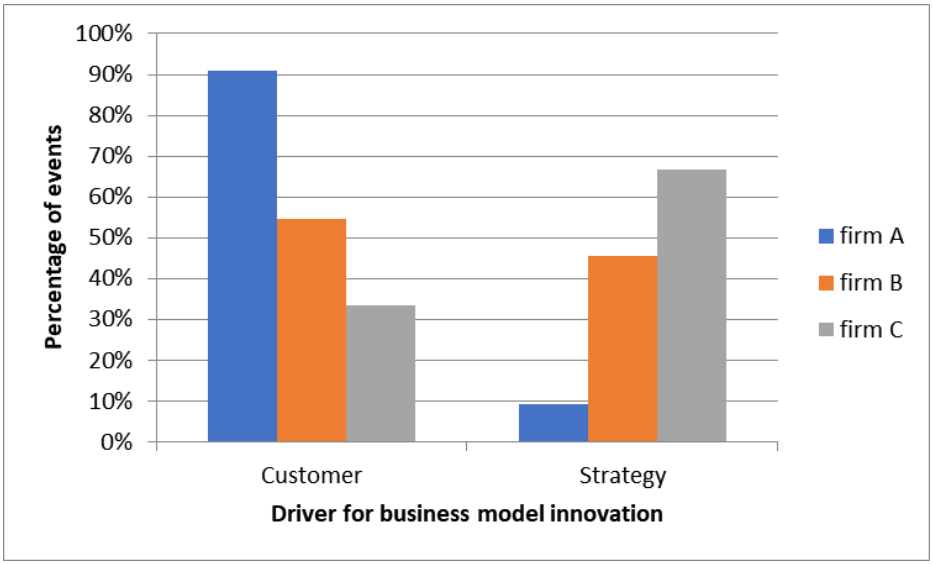
In the following chapter, a cross case analysis is made to search for patterns. A cross-case analysis *"forces investigators to look beyond initial impressions and see evidence thru multiple lenses"*(Eisenhardt, 1989, p. 533). The cross case analysis follows the structure of the summary for every individual case. Graphs from the cases are shown in combination with each other and where needed extra information is generated from the multiple-case analysis.

Table 18 - Main observations of the cross case analysis

- Both customer and strategy driven innovation is used
- Firms mainly use the co-creation and technology levers for customer driven innovation
- Strategy driven renewal involves in particular management and organization
- Customer driven innovation involves often multiple levers
- Firms mainly move from customer driven renewal to strategy driven renewal and vice versa

6.1 First observation: Type of driver

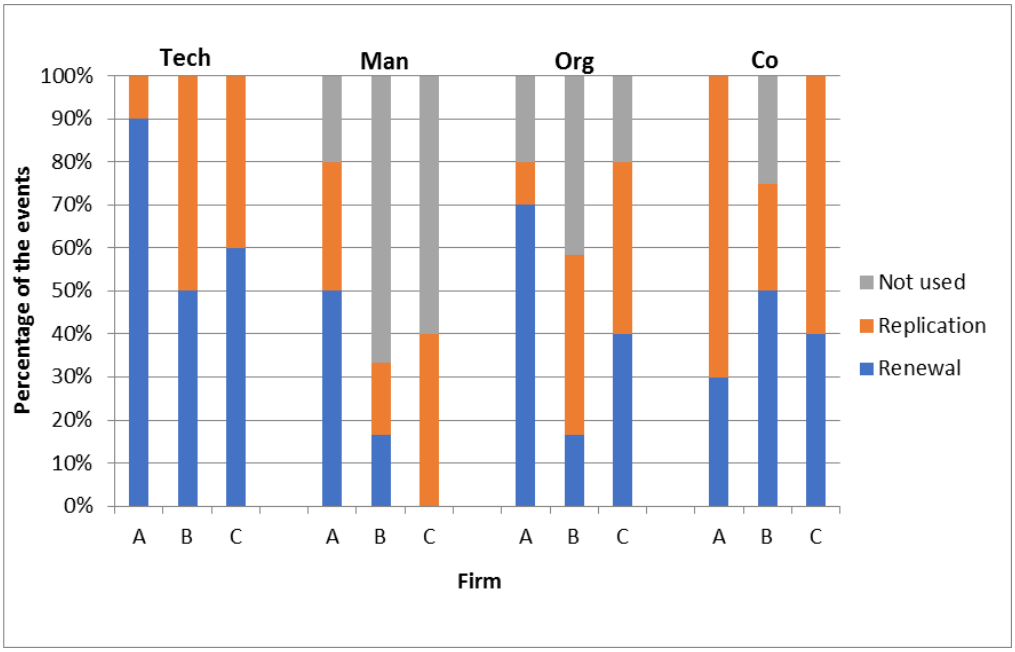
Graph 17 – Observation 1: Customer or strategy driven, multiple case analysis



First an analysis is made on what drives the business model innovation for capital intensive firms. 48 events of business model innovation are processed for three different firms. Comparing these three cases with each other, there is no clear distinction on what the main driver is for business model innovation. Firms use both strategy and the customer as driver for change.

6.2 Second observation: The role of the levers for customer driven innovation

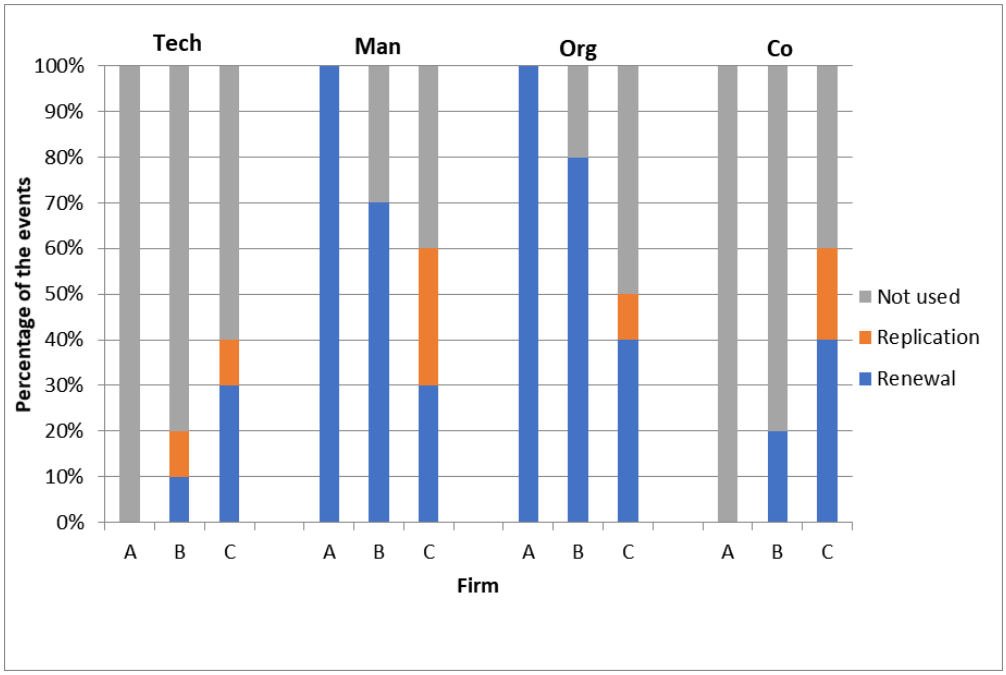
Graph 18 – Observation 2: The role of the levers for customer driven innovation



The 2nd observation is that for customer driven innovation only, a clear pattern can be distilled from the data. At 100% of the events technology is involved in customer driven innovation. Nearly 100% of the events this includes co-making too, only firm B uses co-making 85% of the events. The organization lever is used in an average of 72% of the events, making it an important lever. The lever of management is only frequently used by firm A. Apparently the customer drives capital intensive firms to innovate in technology and co-creation.

6.3 Third observation: The role of the levers for strategy driven innovation

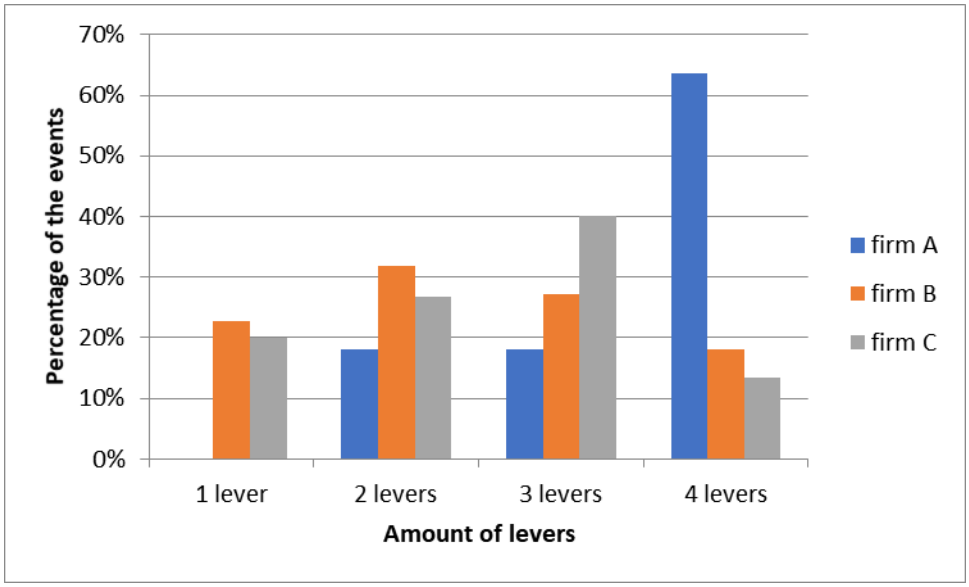
Graph 19 – Observation 3: The role of the levers for strategy driven innovation



Third, strategy driven innovation shows various levers being used independently, in combination and either in replication or renewal form. Strategy driven innovation mainly focusses on management and organization. There is a lack of technology innovation pushed by strategy. Which can be argued by the idea that if a customer pays for the technological innovation, firms are able and willing to innovate. If the technology innovation has to come from a strategic move, firms lack willingness and ability to do so. The co-creation lever is not often used for strategy driven innovation. Only where firms strategically initiate cooperation with customers, suppliers or competitors this is the case. Apparently capital intensive firms seek competition instead of cooperation. In particular firm C mentioned that their strategy is to keep prices low with help of maximizing competition between suppliers (Interview firm C, 2018).

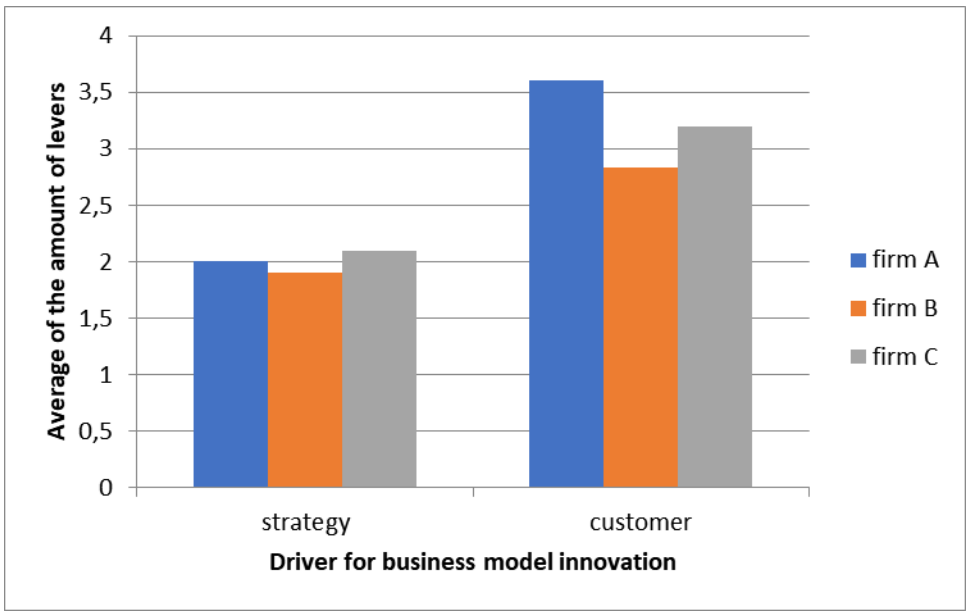
6.4 Fourth observation: The number of levers used

Graph 20 – Observation 4a: Number of levers used



The fourth observation is that the type of driver for business model innovation has a clear influence on the number of levers used. In Graph 20 strategy and customer driven innovation is combined in one graph. The difference between the firms is clearly shown. Firm B and C show similar behaviour, in most of the events two or three levers are used for business model innovation. Firm A stands out by using most of the time 4 levers. The results for separating strategy driven from customer driven business model innovation is shown in Graph 21. Clearly customer driven innovation involves more levers than strategy driven innovation.

Graph 21 – Observation 4b: Number of levers used, strategy driven compared to customer driven



6.5 Fifth observation: Trajectories of business model transformation

Per case a business model transformation matrix is made. The fifth observation is that when comparing the matrixes for the period of 2008 - 2017, it shows that all firms work on business model renewal 70% of the time. In particular the last years, all firms work on customer driven renewal.

Graph 22 – Timeline comparison on three firms

2008	• Renewal - customer driven	• Renewal - strategy driven	
2009	• Replication - customer driven	• Renewal - strategy driven	• Repliction - customer driven
2010	• Replication - customer driven	• Renewal - customer driven	• Renewal - strategy driven
2011	• Renewal - strategy driven	• Replication - customer driven	• Renewal - strategy driven
2012	• Renewal - customer driven	• Replication - customer driven	• Renewal - strategy driven
2013	• Renewal - customer driven	• Renewal - customer driven	• Replication - strategy driven
2014		• Renewal - strategy driven	• Replication - strategy driven
2015	• Renewal - customer driven	• Renewal - strategy driven	• Renewal - customer driven
2016	• Renewal - customer driven	• Renewal - strategy driven	• Renewal - customer driven
2017	• Renewal - customer driven	• Renewal - customer driven	• Renewal - strategy driven

Figure 19- Business model transformation matrix of firm A

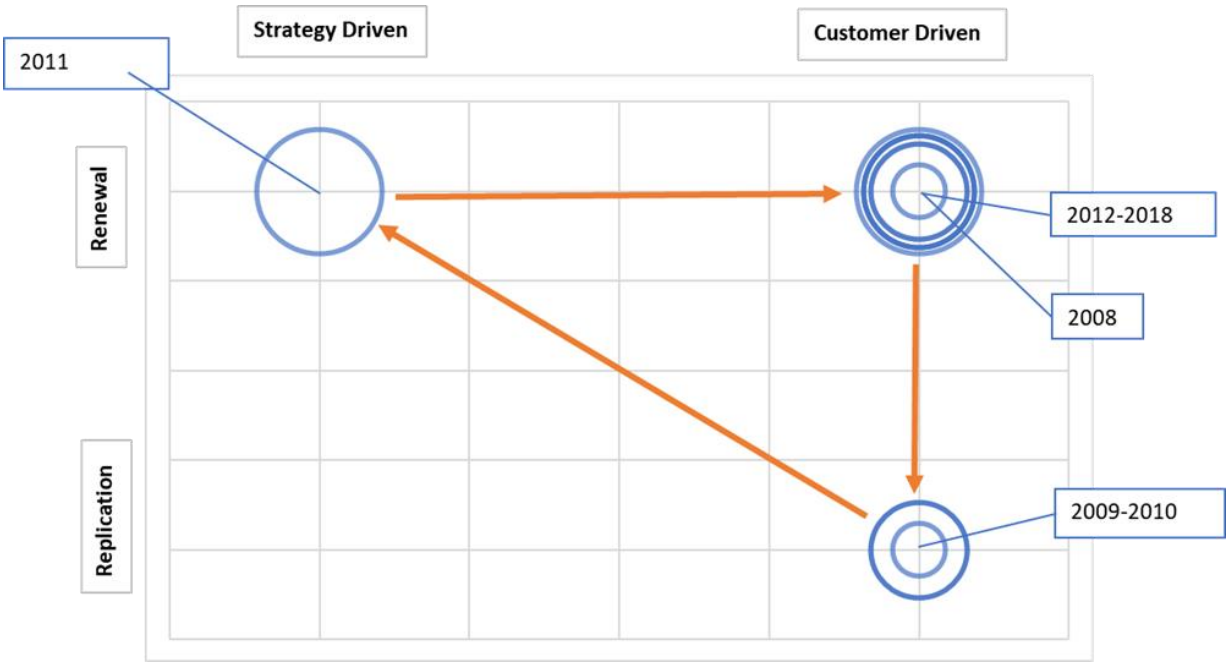


Figure 20 – Business model transformation matrix of firm B

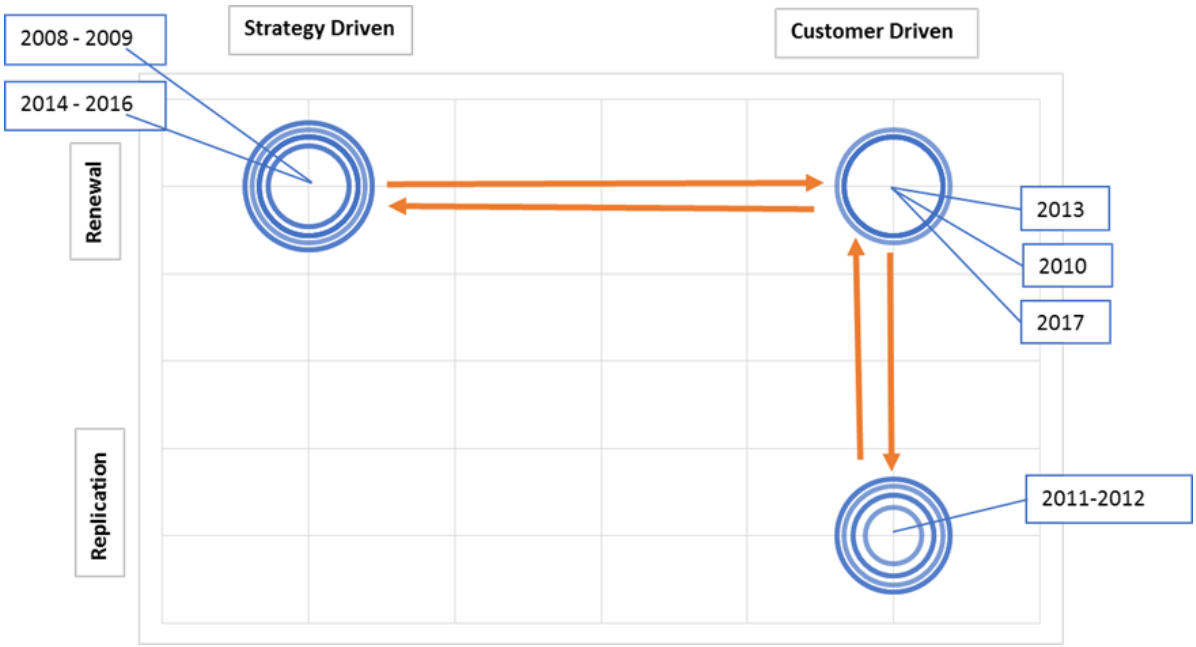
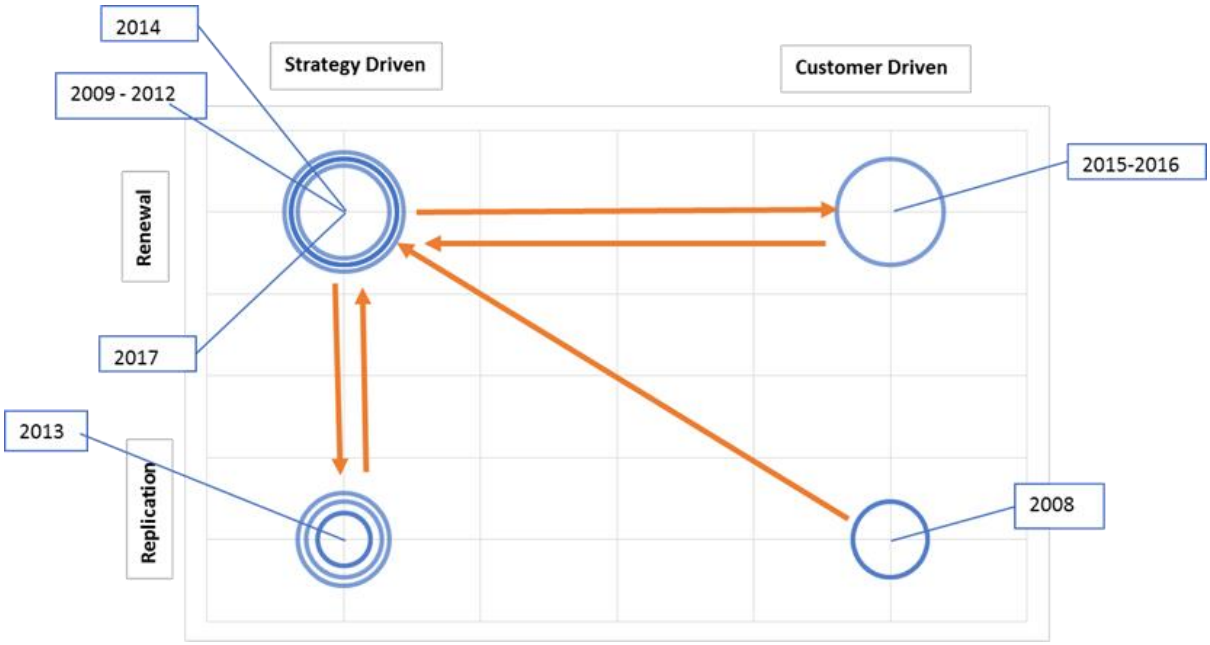


Figure 21 – Business model transformation matrix of firm C



As shown in Figure 19, Figure 20 and Figure 21 the main areas of business model innovation are strategy and customer driven renewal. Depending on the situation, firms move from strategy driven renewal to customer driven renewal and back. Firms A and B use customer driven replication only if it fits customer demands.

All three firms went through a period of strategy driven renewal for management and organization. The economic and oil crisis did affect the business of these three firms and forced management to intervene and renew the levers of the business model.

6.6 Proposition 1 – Management and growth

The first proposition is in line with the *"Theory of the Growth of the Firm"* (Penrose, 1995) and focusses on the role of management during growth.

Proposition 1 – Management and growth

> *During growth, management of established capital intensive firms are likely to use business model replication.*

The firms involved in this research are able to use different business models at the same time. However, some clear observations can be made.

The results in this research show that firm A and C do not necessarily use replication of the business model during growth. Even the contrary can be argued for firm A, since replication of the business model was used to fill gaps in between orders which involved renewal. Also firm C uses replication to keep the assets and the organization occupied, while minimizing the load on the engineering and development capabilities.

Firm B however clearly shows several business model replications during the period 2011-2012, a period in which the firm started to grow towards record breaking revenues. It can thus be argued that the proposition is supported, given certain contextual boundaries.

The main reason for the firms A and C not necessarily replicating the business model is that both firms have a strong project oriented organization, with maximum empowerment of the project director who can, and will, do everything within his capabilities to realize the project. He is thereby not limited to the own organization, but is allowed to hire, subcontract, reorganize and acquire as deemed necessary to benefit to the result.

6.7 Proposition 2 – Management and decline

Continuing on the first proposition, a second proposition is developed for the surplus of management during decline of a firms demand.

Proposition 2 - Management and decline

> *Management of established, capital intensive firms are likely to renew their business model during a period of decline in demand.*

For this proposition it is mentioned too that the firms within this research are able to work with different business models at the same time. However, for this proposition all three firms show clear results.

Due to the economic crisis all firms within this research encountered a strong decline in business. For all three firms this happened at a different period in time. All three firms strategically renewed the

firm with the management and organizational levers. This proposition is therefore fully supported by this research.

For firms B and C it was necessary to change top management of the firms. For firm B the CEO and CFO were changed and for firm C the new owner appointed a new CEO. Only management of firm A was able to renew the business model by itself. Supporting to literature (Volberda et al., 2017), management of firm A was within thirteen years in their position and able to renew the business model.

More interestingly, it can be argued that indeed the surplus of managerial resources causes management of firms to renew the business model. Penrose (1995) describes two types of businessmen: entrepreneurs and managers. Clearly the lack of entrepreneurial resources within firms B and C forced the owners to change top management. The change introduced a surplus of entrepreneurial resources in firms B and C, which initiated change. A surplus of entrepreneurial resources were available within firm A, making a change in management not necessary for the owners and the firm was renewed as deemed necessary to pursue new business.

6.8 Proposition 3 – Capital intensity

Proposition 3 focusses on the role of capital intensity and why it hinders technological renewal and how it can be renewed.

Proposition 3 – Capital intensity

Established, capital intensive firms renew the lever of technology mainly driven by new customers.

This thesis tries to explain how capital intensity influences the ability for firms to change their business model. During the interviews, all interviewees supported the view from literature that capital intensive assets hinders firms to renew their business model. In particular firm B encountered this when their current customers did not order products anymore and there was an imminent need to change. Firm B was not able to design and build newer and smaller products at a competitive price, due to their large and efficient assets.

All firms within this research however, are able to renew the lever of technology. Indeed the firms do so mainly customer driven. Out of 22 events of technological renewal, only four times this is driven by strategy. Firm C renewed the lever of technology in 50% of the time strategy driven. Firm B did so once by starting a new factory.

From literature it is expected that in particular *new* customers will drive renewal of a business model and *existing* customers will drive replication. Within context, this proposition is supported. What the firms within this research try to achieve is to solve the problem for the customer. This means that if the customer encounters a new technological challenge, these firms develop new technology that solves the problem of the customer, whether it is an existing customer or a new customer. This is in particular the case for firms A and B.

Firm C is able to renew technology as part of strategy. Ships with new technology are being developed and build on speculation, where the owner takes the risk by claiming that if it does not sell, he will buy it (Interview firm C, 2018). This shows that the capital intensity of new technology is less of a problem for firm C, since the owner apparently is able to bear the costs of failure which minimizes the risk for the firm.

The cross-case analysis shows that in particular co-creation is important for technological renewal. In 20 of the 22 events, co-creation was supporting the technological renewal. For all three firms a pattern can be distilled that describes how the firm acts as a conductor of the industry, while the customer drives the renewal by financing the new product. Suppliers and partners propose solutions in co-creation with the firms who act often as main contractor. Apparently the three firms within the research have better understanding of the customer and better understanding of the suppliers.

7 Conclusions

In the following chapter the central research question will be answered, contributions to theory will be addressed and managerial implications will be elaborated. This chapter end with the limitations to this research and suggestions for further research.

7.1 Answer to the research question

To answer the question "How does management of established, capital intensive firms, in an industry that experiences strong fluctuations in demand, use the four levers of business model innovation over time in order to influence competitive advantage?" reference is made to the cross-case analysis. Several conclusions can be distilled from this research.

Clearly all three firms innovate their business model mainly *customer driven*. After several waves of renewal and replication, driven by the customer, firms lose their competitive advantage and intervene in the business model.

Management will, after several waves of customer driven innovation, renew the business model *driven by strategy* and mainly renew the organization and its management. This is motivated by the lack of order intake and the resulting surplus of *entrepreneurial management*.

If a firm is able to continuously find *new demanding customers*, they will be forced to change the business model driven by the customer. This limits the need for management to intervene. Management acts supportive and the firm is able to renew the business model with help of the customer.

Firms that focus mainly on *existing customers* will replicate the business model as expected by the existing customer and existing management. As a result, the firm will lose a competitive advantage.

If a firm lacks the financial resources or the willingness to renew the *capital intensive technology* by itself, it can make use of a new demanding customer to finance the renewal. Not only the financial reward, but also the short term reward helps to reduce risk of the investment and helps to reduce the bias of management that is too focussed on utilization of current assets.

7.2 Contributions to theory

The results of this research provide three contributions to theory, as expressed in Table 19.

Table 19 - Contributions to theory

• The “Penrose effect” can be decreased by the form of organization a firm uses • The “Penrose effect” occurs during *decline* in demand too: managerial services become *available*. But during decline in demand, only the entrepreneurial services that become available will pursue change of the business model of a firm. • Renewal of the lever of technology can be enabled with the help of a new, demanding, customer

The contribution to theory for proposition 1 is that organizational forms can inhibit the “Penrose effect” and enable firms to renew their business model and grow at the same time. The firms within this research do so by applying a project oriented organization. Success of a project organization largely depends on the empowerment given by top management. This enables a project director to steer the project as deemed necessary to fulfil the obligations towards the customer. If current structures within the firm hamper the project director in achieving his goals, he will be entitled to skip the own organization and manage the change by himself.

The contribution to theory for proposition 2 is that little empirical studies are available for the role of management during decline of demand. The three cases show that indeed during decline a surplus of managerial services becomes available, but this will only benefit the firm if these managers are entrepreneurs who want to renew the business model of the firm. If these entrepreneurial services do not become available, owners should intervene and appoint the right management with the necessary entrepreneurial capabilities.

The contribution on theory for proposition 3 is that the lack of financial resources to renew the lever of technology can be overcome with help of the customer. Renewal of the technology lever is possible by co-creating with customers, suppliers and partners where in particular a new demanding customer acts as the driver of change and the suppliers and partners enable the firm to renew in a direction that fits both customers and suppliers. The role of management is to support the ideas of the new demanding customer and enable renewal accordingly.

7.3 Managerial implications

The results of the research show several implications for management, which are shown in Table 20.

Table 20 - Managerial implications

- Management of established, capital intensive firms should be entrepreneurial enough to minimize the influence of existing customers within the firm and improve the competitive advantage.
- Management of established, capital intensive firms can use the surplus of entrepreneurial management to renew the business model during decline in demand and improve the competitive advantage.
- The lack of financial resources for renewal of the capital intense technology lever can be overcome by using new demanding customers to fund the renewal.
- Renewal of the technology lever takes place by co-creation with customers, suppliers and partners to radically innovate the technology and provide a competitive advantage.
- Strategy driven renewal of the business model with the levers of management and organization aligns the firms abilities with the needs of new customers and the potentials of new markets, which provides the firm a competitive advantage.
- An ambidextrous organization is able to renew and replicate different business models at the same time and provides a competitive advantage to the firm.

Too much *listening to the existing customer* demands will hinder renewal of a firms business model and makes the firm vulnerable for disruption (Christensen, C. M., Raynor, M. E., & McDonald, R., 2015). The demands of the existing customer do not change as fast as new technology can be developed. New entrants to the industry can thus develop new technology in a different and often less costly way then established firms did in the past. New entrants will in the end meet demands of main stream customers, which indicate that the established firm is being disrupted by the new entrant. This is clearly shown in case B, where the firm was too busy with current customers, which prevented a successful enter on a different market. Now, firm B has become a laggard, where in the past firm B was top of the industry. To prevent this, firms need to stay ahead of the change, which in particular top management has to facilitate. The ability to balance between exploitation of the current business model and exploration of new business models is called ambidextrous capabilities (Jansen et al., 2006). Firms need to attract and organize enough managerial resources to make it possible to develop new business with new demanding customers.

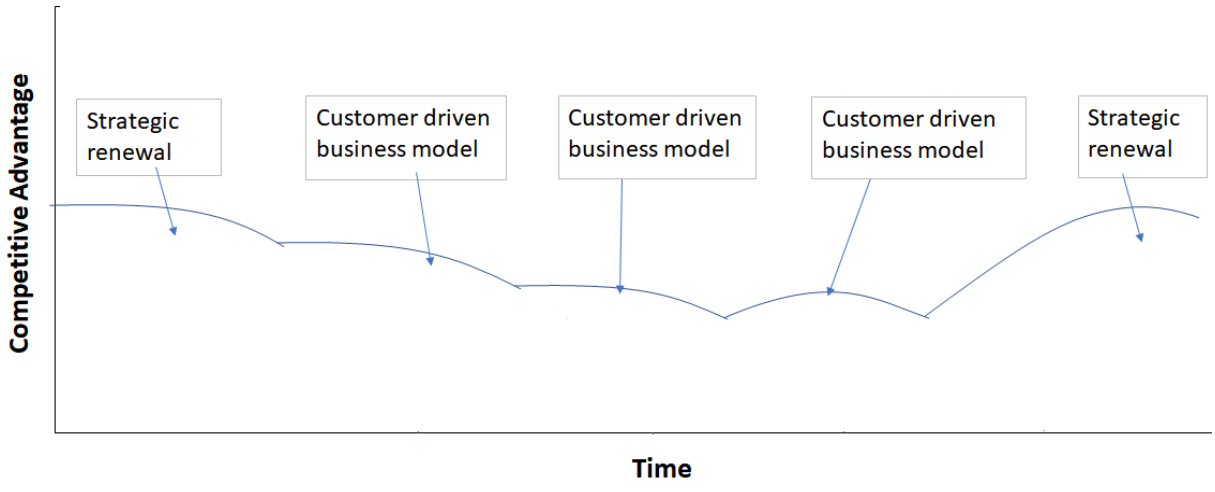
To renew the business model of a firm, management must be *entrepreneurial* enough to see the opportunities. For firm B and C this was not the case. Management of these two firms was changed at a critical point in time. For firm B it can be argued that the timing was rather late, the orders were not coming in for a long time, but since they were working on existing orders with record breaking revenues, management was held at place. For firm C the timing was rather early and strait after the take-over by the new owner. Yet, both changes introduced new entrepreneurial management that lead both firms in new directions. Management of firm A was able to renew the business model by

itself. It is likely that this is caused by the tenure of management. At that time all of the managers were not longer than 13 years in their position, reducing bias of management and making business model renewal less difficult (Volberda et al., 2017, p. 126). Thus, if management is lacking entrepreneurial capabilities, it should either attract the capabilities or management itself should be changed in order to make business model renewal possible.

In the end, firms need to *change and develop their technology* to stay competitive. How did these three firms do so? This research clearly shows that for large capital intensive firms, development of technology is part of co-creation. All firms developed their products and knowledge with co-creation. Apparently firms are reluctant to invest in technology if the rewards are unclear. They will only invest in technology if there *is a customer who is pushing* the firm to do so. Only firm C invested a lot in technology, driven by strategy. It even developed an entire new to the world product without this product being sold. During the interview however, the interviewee mentioned that *"if the vessel wasn't sold, the owner of the firm would buy it"* (Interview firm C, 2018), this dramatically reduces the risk for the firm to develop such a product on speculation. Not changing the technology lever introduces risks to the firm when the context of the firm changes. One of the firms clearly encountered a "Schumpeterian shock" (Schumpeter & Opie, 1934). The interviewee explains that the assets build up by the company were tailor made to build as efficient as possible the largest constructions possible. Fully in line with Barney (1991) and the strategic assets. Yet, due to the oil crisis, these constructions were not requested anymore and the firm was left with assets unable to deliver the new requested products in an efficient way. Interestingly, radically changing or selling the asset was not considered as a real option. This supports the idea that a constant strive for efficiency can become the reason for losing a competitive advantage. Thus renewal of the technology lever, funded by the customer and with help of co-creation is a way of overcoming the lack of financial resources to renew the capital intensive assets.

In time, the waves of business model innovation as encountered in this research are modelled in Figure 22. Within this research, all firms renewed their business model strategy driven. In between two events of strategy driven business model renewal, several waves of customer driven business model innovation occur. If management of a firm gets indications from the environment that it is lacking a competitive advantage, management initiates a strategic renewal. This is visualized in Figure 22.

Figure 22 - Waves of business model innovation for established, capital intensive firms



The conclusion of this research is that capital intensive firms need to renew their business model strategy driven to be able to serve the customer even better. The ability to do so is a competitive advantage. Yet, to renew a business model *"is a risky process" (*Volberda et al., 2017, p. 30). It involves experimentation. And what is shown in this research, management is reluctant to do so if this is not directly supported by a customer. There are several ways for management to facilitate renewal of the business model. This research shows that established, capital intensive firms use the levers of management and organization to strategically renew the business model. For instance firm A changed towards a project oriented organization, firm B changed into multi-disciplinary and more agile teams and currently firm C is changing the organization into a more project oriented organization. To effectively work in a project organization, firms need to develop project management skills and assuring that the actions of the project director benefit to the firm as a whole and not only benefit the project. This type of organization needs specific managerial skills of top management with the most important skill to delegate towards the project director and assure empowerment of the project director in the organization (Interview firm A, 2018; Interview firm B, 2018). On the other hand, current firm governance should help the project director to keep the project aligned with the firms' goals.

7.4 Limitations and suggestions for further research

This research tries to achieve valid, reliable and generalizable conclusions on the concept of business model innovation for established, capital intensive firms. Considering all effort done, there are still several limitations to this research, which will be elaborated in this section.

This research tries to explain how firm changed their business model in the last ten years. The people that were interviewed were part of this history. Two out of three interviewees were reluctant to cooperate on a research that involved business strategy, hence the anonymisation of the results. It is very well possible that they had thinking errors during the interview. In particular hindsight bias and selective observation should be mentioned here (Weusten, 2014). Not every change in a business model ends up in the press. Several events were recovered only with help of the interview, it is likely that some events were forgotten or deliberately not mentioned. This influences the data triangulation since only the events in history that actually ended up in documents were discussed. As shown for the three cases, several other events do not show up in the press and can thus be forgotten or hided from the interview, since the interviewee sees them not as relevant enough. This influence the validity of results of the cases in particular for those events in history.

The interpretation of the events is based on research by Volberda et al. (2017). This interpretation is done by the observer with help and guidance. Inexperience with scientific research and ambiguity of the concept of business models will likely influence the interpretation of the data collected. Other, more experienced observers might come to other results. Inexperience and ambiguity of the business model concept thus influence the reliability of this research.

Finally, during this research it became clear that the firms researched have more or less the same type of organization, which is a project oriented organization. Firms build often only one specific product at a time, sometimes a few. Capital intense firms like Tata Steel produce, contrary to this research, large volumes of steel. It is therefore possible that the results of this research do mainly apply on project oriented organizations, which is a limitation on the generalizability of type of organization.

A suggestion for further research in the field of business model innovation is that during one of the interviews it was mentioned that the interviewee experienced several reorganization in his career. He mentioned that *"for success in implementation you need to make change visible, make the employees feel the change"* (Interview firm C, 2018). He further elaborated that the most successful reorganization he experienced, were the ones where people were actually asked to move to another bureau, office or building. Clearly an act of leadership that changed not only the formal organization but also the physical organization. If the physical location of the individual remains intact, the informal organization remains intact and therefor change is hampered by the informal organization. Since two-third of the large organizations struggle to implement strategies (Sull, Homkes, & Sull, 2015) it will be very important to understand the effect of a physical reorganization and the role management has in moving employees from one bureau to the other.

During all three interviews it became clear that the absorptive capacity of the firms play an essential role in renewing the business model. Interestingly, all three firms have a different level of absorptive capacity (Interviews, 2018). Firm C has a strategy which involves subcontracting of everything. Firm A subcontracts a lot, but not everything, and Firm B subcontracts the least. Within this research it seems that the co-creation lever plays and essential role in the absorptive capacity of these firms. Volberda et al.(2017) mention that: *"It is important to note here that firms need to balance external growth, which involves collaboration with outside parties, against autonomous, organic growth".* It would be therefore very interesting to understand why and how these successful firms co-create on certain activities and why not on others. This will help to understand the benefits and risks involved in co-creation to acquire a competitive advantage.

This thesis on business model innovation for established, capital intensive firms explain how these firms innovate their business model when encountered with strong fluctuations in demand. From an extensive literature review, three propositions and the corresponding framework was developed which focusses on the role of management in business model innovation. In particular the work of Penrose (1995) and the resource based view of the firm have an important role in this thesis. To answer the research question **"How does management of established, capital intensive firms, in an industry that experiences strong fluctuations in demand, use the four levers of business model innovation over time in order to influence competitive advantage?",** three case studies were conducted which show which levers of business model innovation are used by management. Management can use the lever of technology, management itself, the organization and co-creation to innovate the business model. The ability to innovate the business model is influenced by the firms' cultural aspects and type of leadership, CEO characteristics, level of external orientation, organizational characteristics and the institutions (Volberda et al., 2017). From the cross-case analysis it is concluded that the firms within this research mainly innovate their business model customer driven. After several waves of customer driven business model innovation, management intervenes and strategically renew the business model in order to develop a competitive advantage. Limitations on this research include the organizational characteristics, bias of the interviewee and the experience of the researcher. Suggestions for further research in the field of business model innovation are made which include the role of management in reorganizing the physical organization and the role of co-creation in the absorptive capacity of firms.

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9 Attachment – Interview Guideline

Interview guideline

For every event:

- Technology
  - What technology was developed or changed? Product or production technology?
  - New software or hardware?
  - Was the manufacturing process changed with help of new tools, machines, facilities?

- Management
  - Did managers change position and what is there background?
  - What is the involvement of top management in the event?
  - What is the involvement of middle management in the event?

- Organization
  - Did the physical organization change?
  - Did the formal organization change?
  - Did the informal organization change?
  - Were people hired or laid off?

- Co-creation
  - What is the role of the customer in the event?
  - What is the role of suppliers in the event?
  - What part of the work was done by the focal firm and what did others do? Teaming or subcontracting?

Enablers & Inhibitors

1. Style of leadership? Directive or providing a point at the horizon?
2. Organizational Identity? Does everybody understand and know the history of the firm?
3. How is innovation organized? Do you have an example?
4. Length of CEO tenure
5. Absorptive capacity. Can you elaborate on product development for the firm?
6. Listening to the customer. Existing customers or new customers?
7. Internal cooperation
8. Organizational growth: is the firm growing?
9. Corporate governance: what kind of owner does the firm have? Private or corporate?
10. Compliance with law and regulation
11. Capital intensity: Can the firm easily change the assets to realize new products and business?