


# BM roadmapping approach: overcoming barriers for the implementation of Lead Time Based Pricing

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# BM roadmapping approach: overcoming barriers for the implementation of Lead Time based Pricing

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# Executive Summary

The discipline of revenue management has redefined the business model of many service industries. For instance, the airline industry is the pioneer of using revenue management techniques with the pricing depending on companies' seat allocation capacities. After its success, we have experienced a spill over into other service industries such as hotel industry, car rental, sky stations, etc. While revenue management is a successfully used technique in service industries, it is a far less used technique in manufacturing industries, despite its applicability potential (see section 1.7.1).

The navigation through revenue management literature review shows similar patterns, being extensive for service industries but falling into a normative mathematical nature of understanding how companies order management could be modelled for revenue management application. Few studies have a social science nature to reflect the revenue management state-of-the-art for manufacturers, see (Defregger, 2009; Zatta, 2016). The research, then, acknowledges the gap in understanding the barriers which hinder the implementation of revenue management for manufacturing firms and it aims to help towards the implementation of revenue management. Innovatively, the research focuses on the implementation of lead time-based pricing (see section 1.3.1), a price-based revenue management strategy which aims at optimizing pricing based on the price differentiation for faster services.

This research, then, considers the implementation of lead time-based pricing to fall into the business model innovation field as it is seen in other industries, the revenue management implementation shook established business models of incumbent firms. The argument for focusing on the business innovation field is that the implementation of a revenue management technique will largely change the manufacturer business model. The review of this field detects the business model roadmapping approach of (de Reuver, Bouwman, & Haaker, 2013) to be a useful tool for planning the implementation and change from an established business model towards a desired business model. The researcher decided to modify the business model roadmapping approach combining it with the business model innovation process and focus on designing activities to overcome the barriers presented with the lead time-based pricing implementation.

Two research objectives are to be discussed in this thesis, one being scientific and the other being practical research objective. The objectives are described below:

**Scientific research objective**

Understand how the business model roadmapping and the business model innovation process can be combined into one approach in order to help defining a roadmap which aims at overcoming barriers.

**Practical research objective**

Provide the lead time-based pricing implementation roadmap for overcoming barriers presented in revenue management for manufacturers.

The two objectives were combined into the elaboration of the following main research question:

*Which is the utility of combining business model roadmapping and business model innovation process to overcome barriers for the Lead Time Based Pricing implementation for manufacturers?*

To answer the main research question, the research was built from the knowledge on business model roadmapping approach, business model ontology, business model innovation process conceptualization and business model innovation barriers. The business model ontology selected to be used was the STOF model (Service, Technology, Organization and Finance) of (Bouwman, Faber, Haaker, Kijl, & De Reuver, 2008). The phases for conceptualizing the business model innovation process were obtained from (Sosna, Trevinyo-Rodríguez, & Velamuri, 2010). This research undertook a business model innovation literature review to obtain a comprehensive list of barriers. Given the previous concepts, the research designed the concept combination described above in a theoretical framework (see section 2.6).

The research methodology selected to build upon the theoretical framework and answer the main research question was a single qualitative case study. Expert interviews were pursued in order to understand the impact, requirements and activities needed to implement lead time-based pricing. The twelve in-depth semi-structured interviews were codified using ATLAS.ti 8.0 and subsequently analysed to, firstly, identify the business model innovation barriers applicable to

lead time-based pricing and secondly gather enough knowledge to pursue business model roadmapping with great level of detail.

The barrier analysis led to the definition and classification of the barriers found in Table 4. The analysis unveils the importance of the lack of top management barrier as it is necessary to develop the business model within the organisation and it provides a barriers classification based on Level I or critical and Level II or supportive barriers. Also, the research analysis shows a causal map where barrier correlation is presented leading to conclude that few of the barriers have correlation with each other, fact that makes more difficult the process of overcoming barriers.

The lead time-based pricing roadmap was developed based on the synthesis of finding from the interviews. The visualization of the roadmap is seen in Image 14. To assess the process of roadmap creation three topics were pointed. First, the preciseness of activity design declines along the roadmap. Second, the utility of the roadmap remains until major learning take place. Third, the roadmap should be re-update during the business model implementation process to allocate the changes in the model.

To assess the usefulness of the approach undertaken, three topics are addressed, the utility of business model roadmapping, the utility of combining it with the conceptualisation of the business model innovation process and the utility of considering business model barriers in the process. Firstly, the utility of business model roadmapping is high. The benefits of pursuing business model roadmapping go beyond the design of activities and the visualization of the activities' sequence. This process challenges the initial mental business model and involves external partners with whom the business model is presented and discuss leading to potential synergies, business model support and opportunities for the development of the business model.

Secondly, the business model innovation process certainly gives more structure to the approach by providing the transition phases of a new business model. A trade-off needs to be considered. The more structured process helps increasing the quality of the designed roadmap and provides answer to understand when should each phase of the business model innovation process begin. On the negative side, the structure process could hinder the creativity and innovation required within business model innovation and due to the greater amount of detailed actions, the roadmap might be outdated sooner. Overall, given the trade-off, the research suggests a high utility of combining both concepts and therefore, the research introduces the

concept business model innovation roadmapping process to described the combination of business model roadmapping and business model innovation process.

Thirdly, the usefulness of BMI barrier is also rated as high as in business model innovation, business model might fail for un-related factors to the business model desired but to the fact that a business model is somewhat employees live with and many of the described barriers come from cognitive issues of the employees. The research proposes the optional activities seen in the roadmap to overcome the defined barriers in this research.

Scientific reflection on the approach used is also address with three major claims. Firstly, the BMI roadmapping process does not take into account the external situation (market, contextual factors, competitors, etc) and therefore, the approach cannot recommend at which point in time to pursue each of the phases of the business model innovation process. Secondly, the business model ontology used in this research, the STOF model, presents domains which are not mutually exclusive from each other which lead to conflicts in designing activities and barriers when they regard to more than one domain. Thirdly, the researcher proposes a feedback-loop activity at the end of each phase of the roadmap where the practitioner re-assesses the roadmap and updates it reflecting on previous learning.

Scientific reflection on the lead time-based pricing roadmap is addressed with one claim. The possession of the roadmap without having pursued its development internally in your organization fails to provide benefits beyond having the knowledge of the activities necessary to pursue for lead time-based pricing implementation. Therefore, the researcher suggests practitioners to undertake the business model innovation roadmapping process following this research and comparing the results to obtain the full benefits of pursuing this approach.

Overall, the methodology developed shows the potential of business model innovation roadmapping process as an organizational change process tool. This research contributes to gain knowledge on the forward-looking literature for business model innovation while providing one step closer for the implementation of revenue management in manufacturing firms.

Follow-up research can be pursued in both field of revenue management and business model innovation. On revenue management, longitudinal studies along the implementation in manufacturers can provide a study on the dynamics over time of the revenue management

implementation. Also, it would be interesting to compare the results with other manufacturing industries in order to generalize results. On business model innovation, plenty of study can be undertake. Focusing on barriers, the analysis of a specific research field with relation to business model innovation could extend the barriers finding and provide deeper findings. For business model roadmapping, it can be assessed which domain could be added to framework, especially for external domains such as competition, in order to provide further information to understand when to pursue each activity and how to do it.

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**Table of Abbreviations**

| Abbreviation | Meaning |
|---|---|
| ATO | Assemble-to-order |
| ATV | Automotive division |
| BE | Back-End (part of the semiconductor manufacturing process) |
| BM | Business Model |
| BMI | Business Model Innovation |
| BSA | Basic Supply Agreement |
| CLM | Customer Logistics Manager |
| CRM | Customer Relationship Management |
| CWD | Customer Wish Date |
| DSS | Digital Security Systems division |
| ERP | Enterprise Resource Planning |
| FE | Front- End (part of the semiconductor manufacturing process) |
| IFX | Infineon |
| IPC | Industrial Power Control division |
| IT | Information Technology |
| LT | Lead Time |
| LTBP | Lead Time based Pricing |
| MTO | Make-to-Order |
| MTS | Make-to-Stock |
| NloS&M | Next Level of Sales and Marketing |
| OLT | Order Lead Time |
| PMM | Power Management and Multimarket division |
| RM | Revenue Management |
| Safe-DEED | Safe-Data Enabled Economic Development |
| STOF model | Service, Technology, Organisation and Finance model |
| VPA | Volume Purchase Agreement |

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# 1. Introduction

## 1.1. Problem statement

Companies aim to exploit their innovation through their Business Models (BM). It is common that they spend great efforts to explore new ideas and technologies. However, they often fail to innovate their BM in a way which the innovation would be a success (Chesbrough, 2010). Regarding technology innovation, it is of little value without an appropriate BM (Chesbrough, 2010). The technology represents the enabler for the innovation to be possible and it has no inner value by itself. The value the technology enables is captured by innovating BMs.

Digitalization on manufacturing companies generates innovative opportunities. The collection of data from their supply chain processes brings visibility to innovate i.e. monetize an improved service, greater transparency for the supply chain, better forecast for order management and gains in productivity. However, the commercialization of these opportunities requires Business Model Innovation (BMI) because the manufacturer ought to redefine and change its BM to profit from digitalization. One of the opportunities from digitalization is the creation and management of services to maximize revenue. This falls under the discipline of Revenue Management (RM). In manufacturing industries, RM “is a form of supply and demand management that balance pricing strategies with inventory management” (Wirtz, Kimes, Theng, & Patterson, 2003).

Since RM was firstly introduced in the airlines seat reservation systems, it has spread into different industries. While service industries use RM extensively (i.e. airlines, hotels, car rentals, etc), the RM use in manufacturing industries is limited and scarce despite its potential (Chiang, Chen, & Xu, 2007; Zatta, 2016). Hereby, the research identifies that there is a problem with the RM implementation in manufacturing industries as the concept of RM has already been proved in service industries. For practitioners, the scarce implementation of RM strategies in manufacturing industries shows that there might be a missing opportunity.

The implementation of RM in service industries has changed completely companies’ BMs and their business operations i.e. from direct customer communication and fix prices to sell mainly through third party platforms and dynamic prices. This opportunity could be a game-changer for few manufacturing industries, same as it was for the already mentioned service industries.

Therefore, understanding the barriers revolving around this implementation problem of RM for manufacturers is crucial to enable the potential deployment of RM. Then, an effective plan to overcome these barriers would help understand how RM can be implemented in manufacturing industries.

### 1.1.1. Relevance of Business Models for RM

The quote of Chesbrough (2010) describes the importance of Business Models (BM). He states that “a mediocre technology implemented with a great BM may be more valuable than a great technology exploited via a mediocre BM”. This means that the BM might be of more importance than the product or service commercialized. It can become a strong mechanism to enhance execution. Therefore, an adequate BM is needed to profit from digitalization development.

Zatta (2016) interviews a vast variety of manufacturers. Among the participants he interviewed, he found that the main drawbacks for implementing RM are a lack of experience with RM, no appropriate RM approach and not a clearly defined price strategy. BMs help reducing all three drawbacks as their purpose is to investigate how all the important business pieces can merge into a solution, leading to a learning process which the company gains experience with the topic at stake, allowing itself to move towards next areas of experimentation.

Focusing on the implementation of BMs, few academics argue that BM are useful for executing and implementing strategies. BM field is useful for executing strategy (Richardson, 2008). BMs are of great help to evaluate strategy implementation (Casadesus-Masanell & Ricart, 2010). It can help address disruptions and industry changes by rapidly addressing issues, such as technology or regulatory changes (Lindgardt, Reeves, Stalk & Deimler, 2009).

## 1.2. Research gap

The scientific literature on overall RM is extensive. For a complete overview of RM in service (non-manufacturing) sectors, I suggest to read Talluri and van Ryzin (2004). However, for the manufacturing industry, the picture is quite different. Zatta (2016) claims that the research of RM in manufacturing industries is still in its infancy.

Regarding to RM in manufacturing industries, RM encompasses strategies, tactics and tools for revenue maximization via order management. Order management is the discipline which manages the customer orders and includes production management, inventory management and distribution management. RM literature is mainly focused on order management strategies and simulations which aim at deriving to potential profit optimization. In general, there are three main tactics related to order management; Make-to-Order, Assemble-to-Order and Make-to-Stock (explained in section 2.1.2) which are widely studied by researchers, see (Frederick & Pinder, 1995; Gallien, Tallec, & Schoenmeyr, 2004; Guhlich, Fleischmann, & Stolletz, 2015; Savasaneril & Sayin, 2017).

A RM strategy has an effect beyond the pricing strategy and order management of a manufacturing firm. A RM strategy represents a change in the firm's BM. However, academics mainly focused on developing order management modelling to explain the potential upside for revenues. The research argues that the current literature is myopic as it focuses on a specific part of RM, on order management, failing to consider the big picture. Therefore, the research suggests that social science studies on RM ought to still be developed.

Zatta (2016) looks into the state-of-the-art of RM for manufacturers and together with Defregger (2009), they claim that the manufacturing industries also fulfill the prerequisites for application of RM. Defregger (2009) claims that most manufacturing companies are already using minor pricing optimization tactics, such as segmenting customers, pricing differentiation and forecast demands. However, only very few companies use RM strategies such as capacity allocation techniques, price differentiation for faster services or capacity-based pricing.

Looking into implementation of RM in manufacturing firms, Zatta (2016) claims that manufacturers haven´t identified a specific approach for implementing a RM strategy. This research suggests a potential approach which is called Lead Time Based Pricing (LTBP). LTBP falls under the category of price based-RM, where the order lead time is the variable that makes prices dynamic. Section 1.3.1 argues the approach suitability.

The literature review search, then, focuses into implementation of RM and LTBP. In service industries, a tool which has been successful to implement RM is the so-called RM systems, see Talluri and van Ryzin (2004). However, these systems have only been implemented in service industries (Defregger, 2009), although few researchers already claimed that manufacturing

industries present the characteristics to also benefit from RM. Therefore, the research concludes that there are barriers which hinder the application of RM in manufacturing industries. To the best of the research author´s knowledge, there is no study that explains the barriers which hinder the implementation of RM for manufacturers. Therefore, this is the knowledge gap identified which this research focuses.

## 1.3. Research scope

There are two reasons why this research focuses on LTBP, a price based-RM, instead of RM. The first reason is that this research argues that LTBP might be the potential approach, missing from Zatta (2016), to implement RM (see section 1.3.1). The second reason is that by focusing on a specific approach to do RM, the research is able to focus with greater detail and it is expected to obtain more insightful results. Therefore, this research focuses on both RM and LTBP for the literature review and for the methodology part, it focuses specifically on price based-RM, here called LTBP.

This research proposes to understand and deal with the barriers of LTBP from a BM perspective for two reasons. The first argument is that the introduction of LTBP would change significantly the manner that manufacturers do business. For instance, it is visible the consequence of introducing RM in the airline industry, where each and every company of the industry moved to RM or went bankrupt, see Talluri and van Ryzin, 2004. The second argument is that LTBP can´t be related to just project management or innovation service as this would imply the fit of LTBP in the current BM of manufacturers. The research suggests that LTBP would cause considerable changes in a company BM and, therefore, LTBP ought to be conceptualized as BMI.

Overall, the research scopes both RM and BM fields. In the RM field, we focus on a RM strategy called LTBP arguing that it is a potential strategy to apply RM for manufacturers. To guide towards LTBP implementation, the research focuses on BMs and it specifically covers the following topics. Firstly, the research finds the barriers that hinder the implementation of LTBP for manufacturers. Secondly, the study plans the implementation of LTBP in order to overcome the barriers defined previously. The research uses the BM roadmapping approach from de Reuver et al. (2013) as it is a framework which guides BMs from conception to implementation plan. The BM roadmap, created from BM roadmapping, is useful to help manufacturers planning the RM implementation and, therefore, facilitate the implementation of a RM strategy. Innovatively for the

approach, the research combines it with the BMI process. Thus, the research focuses on understanding the BMI process conceptualization and we select the BMI process conceptualization of Sosna et al. (2010) to combine it with the BM roadmapping. More specifically, the BMI process is used in the third and fourth stage of the BM roadmapping, where the research sequences the planned activities into the different stages of the BMI process. The BMI barriers are also considered for the elaboration of the roadmap as the researcher has identified the existence of barriers blocking the implementation of LTBP.

### 1.3.1. LTBP as potential approach for RM implementation

There are various approaches to implement RM i.e. capacity allocation techniques, price differentiation for faster services or capacity-based pricing. From these approaches, the research supports LTBP (price differentiation for faster services) for three reasons. The first reason is that the order lead time is an important variable within the manufacturing industries. Generally, customer will always look for shorter lead times as it gives them higher flexibility from a supply chain perspective i.e. to plan or to forecast more easily. Therefore, it is valuable for customers to receive shorter lead time orders. The second reason is that it is easy to justify the value provided to the customer as it depends on the lead time. Other techniques, such as price different based on capacity are harder to understand from customer´s view point as it does not bring any extra value to them. The implication is that, theoretically, LTBP should be easier to implement. The third reason lies on the current practices of the operational business between supplier and customer. The implementation of LTBP is closer to current business practices compared to capacity allocation techniques or capacity-based pricing. This means that customer would need to adapt its customer behavior in a greater extent for capacity-based pricing compared to LTBP.

## 1.4. Research objective

It is seen that RM implementations in manufacturing industries present unrevealed issues that need to be tackled. The research objective is to assess the utility of combining BM roadmapping and BMI process to overcome LTBP implementation barriers. The research undertakes a study on BM and LTBP barriers and applies the BM roadmapping technique combined with BMI process and BMI barriers providing as a result the LTBP implementation roadmap. This work has two objectives. The scientific objective is to integrate the BM roadmapping approach with BMI to overcome BMI barriers. The practical objective is to provide

manufacturers the defined LTBP roadmap and BM roadmapping approach to pursue revenue management, which should facilitate BM disruption.

## 1.5. Research questions

With the research objective to assess the suitability of combining BM roadmapping, BMI process and BMI barriers to help manufacturers implement LTBP, the research question is posed as follows:

*Which is the utility of combining BM roadmapping and BMI process to overcome barriers for the Lead Time Based Pricing implementation for manufacturers?*

The answer for the main research question is developed through the author's own interpretation from the elaboration of the BM roadmap for LTBP. In order to discuss and validate the utility of the roadmap obtained, the researcher firstly held interviews to understand the impact of LTBP and subsequently build the BM roadmap. Secondly, the researcher has discussed the roadmap construction with the head of innovation of the case study company. To support the main research, the following sub-questions are formulated:

1. How can we conceptualize the BMI process in order to combine it with BM roadmapping?

The first sub-research question aims at combining BM roadmapping with BMI process. The BMI process gives a time dimension to the BM roadmapping which is beneficial in order to facilitate the task of roadmapping as it expects to reduce the cognitive difficulty of roadmapping. Therefore, this question focuses on the conceptualization of the BMI process via literature review.

2. Which are the barriers posed with BMI?

Given the previous identification of barriers hindering the implementation of LTBP, a generic identification and classification of BMI barriers is pursued via literature review. The objective is to identify generic barriers that would hinder the implementation of desired BMs. The argumentation is that acknowledging beforehand the barriers and taking them into account for the activity planning is meaningful for the elaboration of the roadmap.

3. Which are the barriers and their influences on LTBP implementation?

The goal is to assess whether the barriers found in literature are also perceived for the implementation of LTBP and understand which are the most important barriers to tackle for the BM roadmapping. This sub-research question is answered from the analysis of results in chapter 5. The resulting barriers from this sub question are taken into consideration for the activities planning within BM roadmapping. Furthermore, a relationship of barriers is built in order to understand the origin and causality of barriers.

4. Which is the BM roadmap that facilitates the LTBP implementation?

The activity design and sequence form the BM roadmap. This sub question is characterized by the definition of actions and activities to overcome the barriers identified in the previous sub question. The visualization of the activities in sequence forms the proposed roadmap to follow for the LTBP implementation. This sub-question covers the engagement with BM roadmapping in combination with the BMI process and BMI barriers. This sub-question is answered in chapter 6.

## 1.6. Conceptual model

Based on the objective of this study, a conceptual framework has been developed. This model aims at building an exhaustive representation of the research problem. The model consists of the main concepts and linkages that need to be considered for answering the research question.

As defined by de Reuver et al. (2013), “BM roadmapping is the process of developing a BM roadmap as a plan with intermediate steps to achieve a desired BM starting from another BM”. This process is built from the identified necessary activities to move towards the desired BM. This research unveils the BMI barriers to be taken into account along the BMI process. Therefore, BM roadmapping allows to define and sequence the right activities, those that aim at overcoming the posed barriers. To allow the companies to build on the right roadmap, the right activities and activity sequence, the BMI process gives the BMI development structure in different phases. Needless to say, there are contextual factors which influence the BMI (Zott & Amit, 2010), subsequently also influencing the implementation of a BM. The acknowledgement of these concepts is necessary to construct and develop our main research question.

The following image presents the relationship between concepts created for this research study.

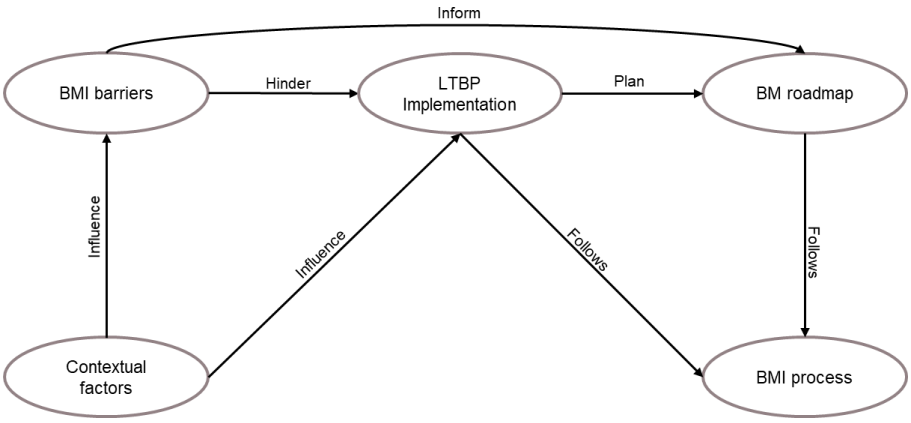



*Image 1: The conceptual model*

The relation of each of the above blocks is stated subsequently. The implementation of LTBP is hindered because of a series of BMI barriers. In turn, the barriers and LTBP implementation are influenced by contextual factors. This research proposes to plan the LTBP implementation with BM roadmapping, whose activities are defined to overcome barriers along the BMI process. In order to facilitate the LTBP implementation, the research develops the LTBP roadmap.

## 1.7. Research approach

Given the characteristics of the research and the timeline to complete this thesis, the research approach proposed to answer the research question is a qualitative single case study at Infineon.

A qualitative research is conducted in order to understand further a problem which is not understood enough in literature (Creswell, 2007). The use of qualitative research is conducted to understand a complex situation such as the LTBP implementation. The data subtracted in this research comes from managers´ opinions, therefore, it is qualitative by nature.

A single case study allows to investigate deeply the implementation of LTBP in a manufacturer company. According to Yin (2003), case study is a preferred strategy when answering how or why answers under contemporary phenomenon with real world context. The

single case study is selected in order to obtain a comprehensive view of the phenomena under study, capturing the human opinion of a particular phenomenon from different roles and points of view.

Expert interviews are selected as a method for data collection. Although, individual interviews are a classic approach, they offer the advantage of high response rates and high information quality as the interviewer has the opportunity to ask clarifying questions (Hofisi, Hofisi, & Mago, 2014). The data collection is used to explore a phenomenon, identify pattern and draw conclusions.

In the following two section, the research argues the selection suitability of the semiconductor industry and Infineon to pursue this research about RM for manufacturers.

### 1.7.1. Which manufacturing industries can potentially apply RM?

Several available literature have addressed the conditions which make RM a viable option, for service industries see (Wirtz et al., 2003; Talluri & van Ryzin, 2004) and for manufacturing industries see (Defregger, 2009). While not all manufacturing industries have the potential to apply RM, the ones which present the characteristics explained below have the potential to optimize profitability through the application of RM. As this research is focused on a case study at a semiconductor manufacturer, we argue why the semiconductor industry is suitable for RM (for extended information see chapter 4 for a description of the industry and company). See below the conditions from Defregger (2009).

1. Perishability. Perishability refers to the fact that products have a short lifetime. The semiconductor industry is ruled by technological innovation intensity which originated Moore´s law. This lead to consider semiconductor to have short life cycle times and, therefore, semiconductor products can be considered perishable.
2. Limited capacity. Semiconductor firms ought to carefully adjust their production capacity as it is a low-end industry, meaning that margins tend to be low and high level of machine utilization is needed to be profitable. New capacity investments in the semiconductor industry require of at least nine months to start producing.

3. Limited production flexibility. A limited production flexibility means that firms can´t assume drastic changes in production capabilities. As already said in the previous point, high level of utilization is needed and thus, it is hardly to provide production flexibility.

4. Demand variability. The volatility of the semiconductor market leads to demand variability. Then, demand variability increases the chances of valuing a semiconductor higher, especially in peak demand times.

The previous four condition lead to situations where semiconductor products might be scarce and more valuable than its price charged. Therefore, with this information, it is concluded that there is potential for RM in the semiconductor industry.

### 1.7.2. The selected company - Infineon Technologies AG

A digital transformation journey is at the agenda of Infineon Technologies AG where it represents a great effort pursued within every level in the business unit. During my attendance to one of the general meetings, the C-level dedicated the major amount of time explaining its IT strategic development for the upcoming years. The first reason suggesting the suitability of Infineon is the strong focus on digitalization, which is required to pursue any RM strategy.

In the case of Infineon, last year, the LTBP idea was presented to the Sales and Marketing board without leading to further development. Therefore, the second argument to choose Infineon is that the company already considered implementing RM, fact that this study considers more valuable than elsewhere given the certain experience already with the topic. Furthermore, the fact that this research focuses on the barriers to LTBP implementation and that the LTBP idea was stopped at Infineon, it generates the possibility to reflect on the barriers.

For the abovementioned arguments, the research chooses Infineon Technologies as a case study company.

## 1.8. Research contribution

The contribution of this research is two-fold, scientific and practical. On the scientific side, the research contribution lies on two fields, Business Models and Revenue Management.

On the field of revenue management, this research conducts a study on the implementation of LTBP, a RM strategy, at a manufacturing firm. Little applicability for RM is seen in manufacturing industries and that there is no research explaining it. Therefore, the first contribution are the substantive findings on RM and LTBP implementation barriers. This research is the first to contribute on exploring LTBP implementation barriers from a company (manufacturer) perspective. Furthermore, to the best of my knowledge, this research is also the first to introduce LTBP as a RM strategy and it is the first to provide a roadmap for the implementation of a RM strategy.

To conduct this study about LTBP implementation, the research focuses on innovating BMs. In this domain, the research identifies tools that can help towards the implementation of new BMs, such as the BM roadmapping approach which is the tool selected, modified and used in this research. The contribution to the field of BM is specifically on the BM roadmapping approach used in this research. This research integrates the BMI process into the BM roadmapping and develops a roadmap taking into account the BMI barriers. The novelty of this approach is two-fold. Firstly, to the best of my knowledge, this study is the first to add a temporal dimension to the BM roadmapping. It is expected that this combination should provide further benefits for practitioners when undertaking BM roadmapping and it should help further understanding the BMI. Secondly, the BM roadmapping approach reflect the necessary changes for moving from established BM towards a new BM. This research adds the term BMI barrier as it aims at not only providing with the necessary activities to move towards the new BM but also it suggests activities to overcome the barriers during the change process. Therefore, the novelty lies on the approach undertaken and in the conclusion chapter, the researcher proposes to coin the BMI roadmapping process for the combination of BM roadmapping and BMI process.

Overall, the main research question focuses on the utility of combining BM roadmapping with BMI process and BMI barriers. The utility will be assessed with the specific case study employed in this research. The main research contribution is classified as providing a developed BM roadmapping approach in terms of framework creation, however, the case study also leads to scientific content creation in the field of RM.

On the practical side, the research contributes to plan the implementation of LTBP in a manufacturing firm. The research develops the idea of LTBP and the LTBP roadmap, created in this research, is a guideline for practitioners to follow for the implementation of LTBP.

## 1.9. Thesis structure

This thesis is structured in the following way. Chapter 2 provides a review of the existing literature in the domains of RM and BMs. It focuses on RM for manufacturing industries, BM roadmapping, BMI barriers and the BMI process. To end the literature review chapter, the research defines a theoretical framework to base this study. Chapter 3 describes the research methodology and the subsequent activities to engage in this research. Chapter 4 regards to the case study at hand, explaining the company and industry profile. Chapter 5 is the analysis of the research results. It regards to the investigation carried out during the interviews. This chapter validates and extends the LTBP barriers obtained from literature review leading to a causal map where it is showed the relationship between barriers. Furthermore, the chapter explains why LTBP project failed to be selected in Infineon. Chapter 6 is the synthesis of results and the objective is to follow the BM roadmapping approach, combined with the BMI process and the identification of barriers in chapter 5. Chapter 7 discusses the main findings and limitations of the research. We reflect upon the research providing managerial recommendation and directions for further research.

# 2. Literature review

This chapter presents a literature review on the fields of RM and BM. First, the review provides insight into RM for the manufacturing industries. The research discusses the RM state-of-the-art, the different types of RM and it presents LTBP. After assessing the non-existing literature on RM implementation, the research moves into BM literature. In the BM literature, the research explains the two tools used here to build the roadmap: BM frameworks and BM roadmapping. The review, then, moves towards the BMI process as it will be combined with BM roadmapping. To finish with the literature review, the research develops a complete list of BMI barriers. At the end of this chapter, the presented framework integrates the existing research regarding BMI barriers, BMI process and BM roadmapping as research concepts for the following chapters.

## 2.1. Revenue Management

RM[1] "is a form of supply and demand management that balances pricing strategies with inventory management" (Wirtz et al., 2003). The discipline of RM has gradually gained attention since the eighties (Defregger & Kuhn, 2007). However, RM is as old as human business practices exist. Sellers have always faced the same questions about one´s own strategies to increase revenues. The novelty in the field is about how information technology unlocks new opportunities to improve the quality of demand-management decision (van Ryzin, 2005) which in turn allow companies to strategically increase profitability. What van Ryzin suggest is what it has been seen in the service industries with the rise of platform. In the manufacturing industry, this situation hasn´t been yet achieved. Further IT development and scientific advances are the innovation in RM for manufacturers (Zatta, 2016).

### 2.1.1. RM origin and development

In the eighties, with the loosened control on flight prices, the airline industry undertook severe changes driven by innovation (Belobaba, 1987). American Airlines was the first player to

[1] Alternative names for RM are yield management, revenue optimization or demand management. This research will use the term RM (RM).

take advantage of information technology, making prices variable depending on seat allocation levels. It reported increases of $500 and $300 million revenues for American Airlines and Delta (Boyd, 1998), which led to industry price decrease and, companies who didn´t copy American Airline strategy went bankrupt (Talluri & van Ryzin, 2004). RM in the airline industry is a symbolic use case. It is the first breakthrough industry case using RM and it transformed completely the industry players' BMs.

The airline case served as a catalyst to bring RM to business practices along other industries, all within the service domain. Research and use cases are found in many service industries today: healthcare services (Bonnici, 1991), car rentals (Geraghty & Johnson, 1997), restaurants (Kimes, Barrash, & Alexander, 1999), retailers (Lippman, 2003), hotel chains (Choi & Mattila, 2004) and so on. However, in manufacturing industries, it is necessary advanced information technology combined with advance supply chain science i.e. AI forecast methods, demand models, etc. As research in manufacturing industries is still in its infancy (Chiang et al., 2007), very few companies experienced RM and explicitly quoted in the literature (Zatta, 2016).

### 2.1.2. RM in manufacturing Industries

The applicability of RM in the manufacturing industries is slowly being implemented (Berger, 2017). Enterprise systems such as SCM or ERP are offering functionalities to allow revenue optimization for manufacturers (Chiang et al. 2007). The first studies investigating the applicability of RM characteristics for manufacturing industries are (Spengler, Rehkopf, & Volling, 2007) for iron and steel, (Voigt, Saatmann, & Schorr, 2008) for automative and Defregger (2009) for paper, steel and aluminum industries.

The literature on RM for the manufacturing industry focuses extensively on order management from a logistics and operations view i.e. pursuing mathematical simulations rather than social science research. There are three differentiated strategies concerning manufacturers' order management: Make-to-order (MTO), assemble-to-order (ATO) and make-to-stock (MTS). The type of order management selected defines which RM application is the firm more likely to pursue. For instance, MTS manufacturers produce large quantities of standardized products following their forecasts. MTS manufacturers meet their demand by holding inventory on hand compared to MTO, where the companies hedge demand against production capacity (Cheraghi, Dadashzadeh & Venkitachalam, 2010).

In MTO, the goods start the manufacturing process only after customers placed orders. A MTO manufacturer normally produces in smaller lots based on specific orders and customer requests. MTO manufacturers, typically, have to price a continuous stream of bids and request for quotes, where large manufacturers respond to more than 250.000 quotes annually (Talluri & van Ryzin, 2004). In other words, MTO manufacturers place offers for their customer with a quoted price (price to be paid for the goods) under the contractual agreements set between supplier and buyer. Then, the customer places the order and it enters in the production planning systems of the supplier.

Traditionally, MTO manufacturer do not consider price as mechanism to regulate orders (Talluri, van Ryzin, Karaesmen, & Vulcano, 2008). This means that they do not use price mechanisms to regulate the demand volatility, shifting it away during peak-times, also called full allocation period in this research. The most critical problem for MTO is to optimize capacity utilization to satisfy the demand. To clearly illustrate this situation, it is like capacity unused in airline industry. An example to illustrate the literature for MTO is (Gallien et al., 2004). In their paper, they consider a MTO retail and classifies customers as price sensitive, or time sensitive, which influence their buying behavior to optimize market share and revenues.

In ATO systems, the good are semi-produced until a certain level. When customers place the orders, the semi-produced goods are sent to be finished and customized. Guhlich et al. (2014) apply RM on an ATO system model. Their simulation allows the manufacturer to decide whether to accept the order or reject, expecting a more profitable order. Savasaneril and Sayin (2017) look at a production system with inventory, used for improving responsiveness.

The literature on order management has “a conceptual and normative nature and, with the exception of a number of case studies, fail to address the state of RM in the manufacturing industry” (Zatta, 2016). Little empirical research is available on the use of RM in manufacturing, for exception, see Defregger (2009), Cheraghi et al. (2010) and Zatta (2016). From the previous exposed literature, the research claims that there is very little social science research on RM for manufacturers.

### 2.1.3. RM implementation in manufacturing industries

The research barely recognizes empirical researches about RM for manufacturers. The studies of Defregger (2009) and Zatta (2016) discuss the RM state-of-the-art and informing about the scarce implementation of RM in manufacturing industries. The initial work of Defregger (2009) focusing on paper, steel and aluminum industries was further expanded to a higher variety of industries by Zatta (2016). Zatta studied the application of RM in various manufacturing industries and evaluated the risks and perception of companies towards RM. Zatta (2016) suggests that RM demands a management approach that is receptive to science and technology.

Zatta (2016) show that interviewed companies (industries players) assert there is insufficient knowledge to implement RM in the manufacturing industry. This research suggests that the fact that most of the knowledge is presented in forms of mathematical simulations, recall from previous section, does not help further towards the implementation of RM in manufacturers. RM implementation covers many more fields than just the ones related to pricing strategies and order management, being a social science and managerial approach relevant in order to understand the problems that hinder the RM implementation. RM implementation requires a change in the BM of a company and, therefore, it should be analyzed as such. Hence, this research will analyze the RM implementation from a BM perspective.

### 2.1.4. Introduction to Lead Time based Pricing

LTBP regards to one of the RM strategies that can be classified as price or quantity based (Talluri & van Ryzin, 2004; Zatta, 2016). For quantity-based RM, the total manufacturer capacity would be divided into smaller parts, associating a different price to each of them. A similar known example of such strategy is seen in the airline industry where price depends on seat allocation capacity.

LTBP belong to the second classification, price-based RM or dynamic pricing. As information technology advances, the increased ability to retrieve sales data and its availability has helped on increasing the number of companies who adopt a dynamic pricing strategy (Xu & Hopp, 2004). It is based on the recognition that the “correct” price depends upon the willingness to pay of each customer. There might be different alternatives to implement Dynamic Pricing. However, in manufacturing industries, LTBP is especially relevant as earlier order delivery is an

extra value provided by many manufacturers today, at no added price. Thereby, with this RM strategy, pricing variations occur based on the order lead time.

To price the lead time, the seller ought to carefully execute a pricing strategy. On the one hand, overpricing can result in customer dissatisfaction. On the other hand, underpricing will leave potential revenues behind. Customer conflicts will arise as customer might feel it is being unfairly treated (Wirtz et al., 2003). Haws & Bearden (2006) develop a framework to determine the fairness in price judgement made by the customer.

LTBP offers an opportunity exploitation for manufacturers. Many of the manufacturers' customers sign "Just in Time" agreements with their clients, which means they are penalized if products are delivered later than agreed. In turn, the manufacturers' customers pressure the manufacturers to provide earlier delivery times. As manufacturers´ customers value earlier delivery times, they might be willing to pay a premium for faster order lead-time.

Regarding the correlation of LTBP and Order management strategies, seen in section 2.1.2, the potential to apply LTBP depends on the availability from the supplier to deliver the orders earlier on the wished date of the customer. Therefore, it is interesting to study the economic impact of applying MTS for LTBP products. This situation would mean that manufacturing the goods and storing them would ensure the flexibility to undertake LTBP easier than in MTO or ATO. A study of such dimensions is out of scope in this research.

#### *2.1.4.1. The order lead time concept*

The order lead time (OLT) is the timespan between the customer order entry and one of the following three dates: the *wish date* indicates the wished delivery date by the customer, the *delivery date* indicates the date the manufacturer delivers the goods, and, finally, the *contractual date* is the date that the manufacturer has legally agreed to provide goods. The three lead times can be seen in the following figure. Respectively, they are referred as "*OLTrequest"*, "*OLTactual"* and "*OLTcontract"*. The orange arrow refers to the LTBP opportunity to apply LTBP with the customer orders which are willingly ordered with earlier requested lead time than what is contractually stated.

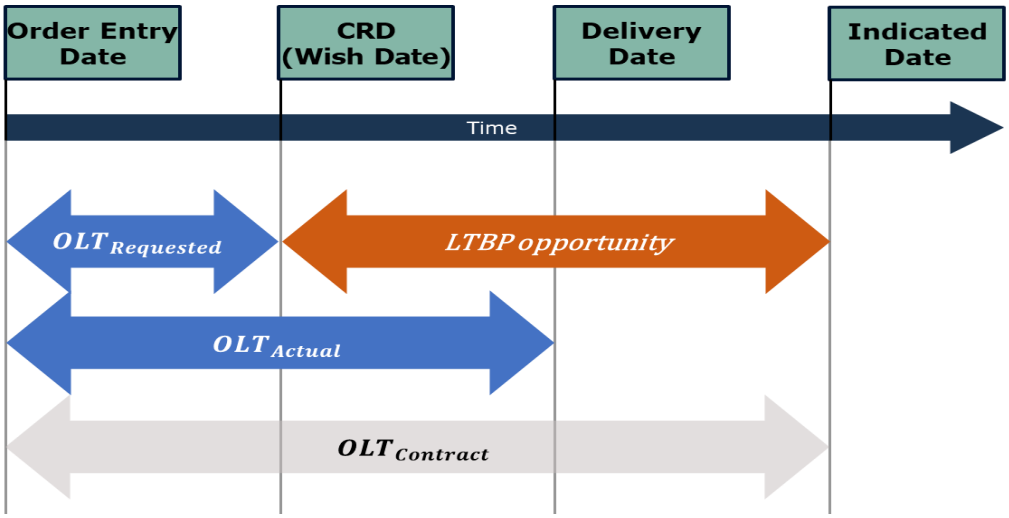



*Image 2: The lead time calculation. Image modified from* (Berger, 2017).

#### *2.1.4.2. The benefits of LTBP implementation*

From the manufacturer perspective, the profit optimization might be the key argument to pursue a LTBP model. However, the benefits of LTBP go beyond the economic value. There are two other key benefits to consider. The first benefit is that LTBP steers the demand because not all customers are willing to pay an extra price for early delivery. Therefore, the manufacturer should experience a decrease in the demand volatility as more customers will order for products with, at least, the contractual lead time and, situations where many customers demanded early deliveries are to be reduced. The advantage of reducing demand volatility is two-fold, the manufacturer can reduce costs and meet more often the requirements posed by customers, increasing the manufacturer's supply chain flexibility. The second key benefit is that customer satisfaction can be increased as the manufacturer is able to deliver earlier orders for a price add that the customer willingly pays.

To sum up, three key benefits are presented with LTBP; (1) profit optimization, (2) steer the demand and (3) increase customer satisfaction.

## 2.2. Business Models

This section focuses on the field of BMs and discusses the key concepts for this research. First, the research gives a brief overview into BM and BMI literature. Second, it explains the two BM tools used here (BM ontologies and BM roadmapping). Following, the research discusses the

conceptualization of the BMI process and it finishes with a literature review and classification of BMI barriers.

### 2.2.1. Strategy and BMs

It is seen a variety of definitions for what BMs are. These definitions depend on the field the researcher is focused and how it is the research positioned. For instance, a BM "is a conceptual tool containing a set of objects, concepts and their relationship with the objective to express the business logic of a specific firm" (Osterwalder, Pigneur & Tucci, 2005). Other authors, such as Teece (2010), define BMs as the means by which enterprise delivers value to customers, including the customer willingness to pay. Richardson (2008) considers BMs a framework for strategy execution. This research aims at capturing value from a service, the LTBP. Thus, the research will consider the definition as follows: "*How organizations or network of organizations intends to create and capture value from offering a service to its customers*" (Bouwman, De Vos & Haaker, 2008). For a comprehensive overview of BM definitions, see (Zott, Amit, & Massa, 2011).

Many academics discuss about the link between Strategy and BMs. Magretta (2002) pointed that people used both terms interchangeably. We follow Richardson (2008) in defining BM as a framework for strategy execution. A clear example of the difference between BM and strategy is given by Wal-Mart. The strategy of Wal-Mart to differentiate from competitors was to offer lower price products. The "how to" implement this strategy is given by the BM. Wal-Mart eliminated every unnecessary cost that had little correlation to increase revenues; avoid purchasing department store´s physical amenities, ability to hold large number of customers at a time and customer self-service (Magretta, 2002).

## 2.3. Business Model Innovation

As name suggests, BMI means innovating a business model. As already seen with BM, the academic divergence on defining BMI is also significant, even greater. Foss and Saebi (2016) distinguish four different stream of BMI research. The first stream discusses what is and what not BMI is. This stream debates the meaningful definition of BMI and the dimension a company can innovate its BM. For a complete overview of BMI definitions, see (Foss & Saebi, 2016). The second stream focuses on organizational change process to explain BMI. This stream focuses on

the capabilities, leadership and mechanisms to succeed with BMI. The third stream discusses the outcome of pursuing BMI. This stream is generally focused on BMI adoption in certain industries and under certain contextual situations. The fourth stream addresses the consequences of BMI in organization performance. This research supports the stream which sees BMI as an organizational change process, a learning process whose use is beyond classification or evaluation but it also serves as a planning and implementation tool. The research supports the definition of BMI stated by Massa and Tucci (2013) who define BMI "as the activity of designing—i.e., creating, implementing and validating— a new BM".

### 2.3.1. BM tools

This section discusses the theoretical background of BM design and BM roadmapping. The BM design tool helps conceptualizing the desired BM. The BM roadmapping tool helps to plan the change from one BM towards another. These tools are important to link the business idea into BM and from high-view BM to the organizational activities required to move to the desired BM. Therefore, these two tools are used in this research to create the plan for implementing LTBP.

#### *2.3.1.1. BM design*

BM designs are represented via ontologies. An ontology, in a computer science definition, is a network of defined concepts with their relationships and constraints which are defined from their semantic properties. In BMs, an ontology is a mutually exclusive and collective exhaustive structure which covers the most important BM development factors. In other research studies, the term referred as BM ontologies, can also be referred as Meta-BMs (Alberts, Meertens, Iacob, & Nieuwenhuis, 2013) or BM Design Framework (Ballon, 2007). Besides the differences in naming, there is a great variety of BM ontologies which depending on the given use case might be more or less useful. Three ontologies are discussed below, the BM canvas (Osterwalder & Pigneur, 2010), the taxonomical scheme from (Ballon, 2007) and the STOF model (Bouwman et al., 2008).

The most popular framework is the BM canvas which is a tool of strategic execution which allows to develop new and existent BM (Osterwalder & Pigneur, 2010). This tool considers customer value creation as the center, following a customer-centric approach such as most of the current enterprise management strategies. The blocks include the value proposition which is depends on the type of customer to serve, customer relationship and, distribution and sales

channels. The key activities, resources and partners are the requirements needed to ensure the model and this leads to the Costs definition. The way the company aims to make revenue is also covered as a block. A strength and limitation of this tool is the narrow focus on a single company´s BM instead of a partner network (de Reuver et al., 2013).

The framework suggested by Ballon (2007) is composed by 4 different levels and three critical issues are identified in each level. Ballon claims the framework to be specially adapted for mobile service BM. The four labels are value network level (the actors of the network and their vertical integration level), functional design level (interrelation between systems, modules and their interface), financial level (profitability model) and value proposition level (main value proposed to the market). However, the high-level of abstraction given in this framework does not help much in the BM design, but in analyzing BMs at a high-level and understanding the key characteristics.

The STOF model was design for creating BMs for (mobile) services (Bouwman, Faber, Haaker, Kijl, & De Reuver, 2008). The STOF model consists of a two-level ontology with Service, Technology, Finance and Organization domain. The second level ontology is seen in each of the blocks which refers to the relevant topics to tackle. The figure shows the first level of STOF and every block has its own ontology.

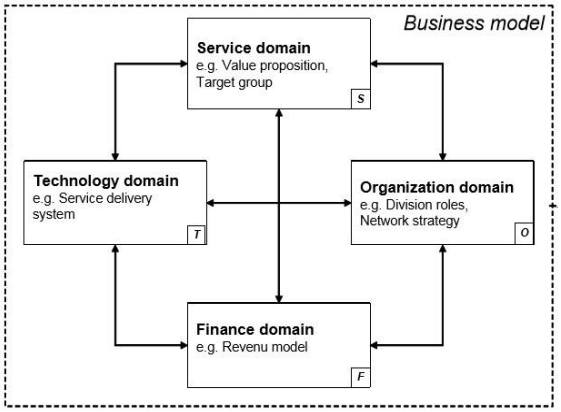



*Image 3: The STOF model. Retrieved from* (Bouwman et al., 2008).

The first component, Service domain, focuses on the value provided to customer. This is a critical component as the customer value defines the willingness to purchase such product or service. This component is especially important for incumbent companies as assessing the right value of their service leads to optimize the overall offering. In LTBP, the value provided to the

customer depends on two variables. The first is the early delivery value, which can be formulated as the increased benefits minus costs for early delivery. The second is the delivery reliability which might affect negatively if the manufacturer cannot keep the agreed delivery time.

The technology domain is characterized by the technical requirements and architecture to accomplish the customer value defined in the previous domain (Bouwman et al., 2008). Any RM strategy requires of a great amount of data leading to also a great amount of computational power. Data is collected from all the parts of the value chain (warehouse, production, allocation, distribution, etc) and every day the system needs to make thousands of forecasts for both, ongoing and received orders. A critical technical requirement is forecast optimization. A high level of optimization leads to higher delivery reliability and potential for higher revenues. From the technology side, the implementation of RM requires advanced IT systems in the following topics; interoperability between systems (such as ERP or CRM), digitalized supply chain and advanced forecast and optimization techniques.

The organization domain refers to the resources and capabilities required to enable the service. The relevant topics to cover are the actors, the value network and activities, interactions and relationships, resources, capabilities, organizational arrangements, strategy and goals ( Bouwman et al., 2008).

The finance domain refers to investment needs, pricing and revenue models. As for investment, many techniques can be used, for instance, the net present value. With LTBP, the pricing strategy is to monetize the order lead time, the shorter is the order lead time wished by the customer the higher revenue potential to be charged.

Given the frameworks stated above, each method structures the BM with different blocks. This research chooses the STOF model for the following reasons. Firstly, the STOF model offers a structure based on two levels. This allows to visualize a greater number of concepts within each of the blocks. STOF is the method that provides the most variables to consider for each block. The STOF gives more structure than the BM canvas (de Reuver et al., 2013). This visualization is believed to be helpful to define the requirements of the BM. The service covers more exhaustively the number of potential significant concepts, for instance compare STOF (i.e. value proposition, expected value, perceived value, delivered value) to Canvas (Value proposition). The technology domain of STOF is specially designed for ICT services, in line with LTBP. The STOF

organizational domain is also an advantage as to change BMs normally requires a series of activities and organizational effort which the STOF covers inside this block.

#### *2.3.1.2. BM roadmapping*

Roadmapping is a process that contributes to product or service development. Roadmapping connects the strategic execution at different levels: strategy level (high-level), BM thinking level and operational or tactical level (de Reuver et al., 2013). Roadmapping origins were developed by Motorola during the seventies in order to improve its technologic product development (Phaal, 2015).

Roadmap development involves, inherently, social mechanisms (Kostoff, Boylan, & Simons, 2004). Through workshops, which is a common methodology to collaboration, stakeholders explore, create and shape firm´s strategy. The role of facilitator lead to efficient workshop processes (Phaal, Farrukh & Probert, 2011). The facilitator directs, clarifies and leads the pace of the workshops to achieve the most relevance. An option for roadmapping is to construct sets of BMs that at a later stage can be a source of experimentation leading to a combination of them. A key concept that contributes to roadmapping popularity is its structured and visual time based activities for the implementation of strategy (Phaal, 2015).

There are many different existing roadmapping models. Phaal et al (2004) suggest to separate them in eight types: product planning, service/capability planning, strategic planning, long-range planning, knowledge asset planning, program planning, process planning and integration planning. Furthermore, Phaal designs a great diversity of templates to help on the roadmapping process. These templates are found at his website[2]. There are other authors who have also proposed new roadmaps. Allan et al (2001) proposes a technology roadmap for semiconductors. Albright & Kappel (2003) proposed a product-technology roadmap which includes the market, product and its drivers and technology. Existing roadmaps have been

[2] The link to the website is https://www.cambridgeroadmapping.net

supported by case studies, however, rarely supported by strong empirical evidence (de Reuver et al., 2013).

De Reuver et al. (2013) proposes to combine roadmapping with BMs. They analyze BMs using the STOF model (Bouwman et al., 2008). They use the roadmapping techniques to change from a current BM to a new one. Their approach suggests to focus on two different layers. First, identify the changes on the BM. Second, focus on these activities that need to be done to transition from one BM to another. The BM roadmapping approach serves as a forecasting and planning tool which can identify potential areas of work and act on them by defining series of activities.

It seems that the transition and implementation of a BM is more challenging that the BM design. For instance, Chesbrough (2010) identifies several issues regarding the transition; "*When to start investing in new technologies*", "*what are the points of no return?*", "when to attract specific talent?" and more. The BM roadmapping won´t give a direct answer to such questions but the goal is to plan the activities which will do so. De Reuver et al. (2013) proposes a four-step model to create the roadmap: (1) Identify desired changes in the BM, (2) Analyze the impact of the desired BM changes on other BM domains, (3) Translate BM changes into specific activities and (4) Back casting of ideal transition path. De Reuver et al. (2013) separates the BM roadmapping steps according to the STOF model. This research will follow the same approach, with the STOF model as BM ontology as it brings the benefits described in the previous section. The objective is to give answer to questions such as; "which BM domains need innovation?", "what activities do we need to innovate in these domains?".

After having looked into the BM roadmapping literature, it can be concluded that BM roadmapping is a research tool that can potentially help towards the implementation process of RM strategies. The introduction of any RM strategy changes substantially the current operations of manufacturers. The BM discipline captures these changes and BM roadmapping allow the planning of high-level business ideas into specific activities which lead to the implementation of a BM. Therefore, this research will use the BM roadmapping tool for planning LTBP implementation.

The limitations of the BM roadmapping described by de Reuver et al. (2013) are the following. First, roadmapping should still leave room for innovation and avoid becoming a *bureaucratic* tool. Second, ambitions ought to be kept realistic as uncertainties and time horizon

play a role, for instance the impossibility to define clear activities or even any activity at all. Adding to the previous limitations, this research argues that it is needed apply a temporal dimension to the BM roadmapping of de Reuver et al. (2013). The lack of temporal dimension in the BM roadmapping complicates the realization of the BM roadmapping steps. This research argues that combining a temporal dimension with BM roadmapping should facilitate the elaboration of four step-wise approach. In other words, it reduces the cognitive difficulty when undertaking BM roadmapping. Furthermore, the research suggests that the better temporal dimension to consider is the phases of BMI process. Theoretically, the combination of BMI process and BM roadmapping should reduce the uncertainty of the activity placement. Phrasing it as a question, it should give answer to “when should we start or finish pursuing each activity?”

After suggesting the benefits of combining BM roadmapping and the BMI process, the following chapter will focus on discussing the conceptualization of the BMI process for this research.

## 2.4. The BMI process

This section reviews different conceptualizations of the BMI process. Afterwards, it suggests the use of the BMI process of Sosna et al. (2013) and the research will discuss each of the phases of the process.

BMI has been proved to be effective for achieving organizational innovation (Zott & Amit, 2007). In the past years, the process of BMI has experienced a strong emphasis to understand and conceptualize BMI in different phases (Schneider & Spieth, 2013). Some studies focus on BMI development for start-ups such as (Trimi & Berbegal-Mirabent, 2012) and others focus on changing incumbent BM (Berends, Smits, Reymen & Podoynitsyna, 2016). In this second stream, BMI is the designed and nontrivial change to the current aspects of firm´s BM (Foss & Saebi, 2016). Focusing on the latter option (established firms) this chapter discusses the process of BMI.

There are two different scholar streams about how BMI process conceptually unfold (Berends et al., 2016). The first stream considers BMI a forward-looking process. This means BMI is conceived and then, action (such as experimentation and implementation) takes place. The second stream considers BMI a backward-looking process, meaning that it is from the action where leads to experience and then it becomes routines (McGrath, 2010). In this second case,

the BM is obtained through action rather than conceptualizing it previously. In reality, deciding whether the new BM came from cognition or action is quite difficult to assert due to the high level of complexity involved in the process. Both approaches might appear simultaneously or iteratively (Berends et al., 2016).

The forward-looking approach is in line of our argument to see BMI as a process that can be conceptualized and, where tangible activities can be allocated in order to influence and steer its development. This does not mean that the weight and importance in action is smaller than in cognition. The degree and relation between cognition-action might depend on several factors, such as the degree of BMI radicalness or the type of actor engaging in BMI. The degree of radicalness depends on the difference between current BM and future BM. The type of actors could be separated between start-ups and incumbents. Incumbent firms can´t simply risk to follow action as much as start-ups because incumbents already have a customer base which can´t be jeopardize.

Within the forward-looking, scholar do also differ on conceptualizing the process of BMI on its sequence. We separate the literature between linear and non-linear BMI processes. Linearly, the BMI is a process that comprises a design and an implementation phase (Enkel & Mezger, 2013). Additions have been proposed, such as separating the design phase into concept design and detail design (Geissdoerfer, Savaget, & Evans, 2017). The main characteristic of BMI linearity is that phases in the process are sequential. Girotra & Netessine (2013) proposes a linear process for doing BMI and separates the different steps in gates.

In the non-linear conceptualization, many researchers adopt their own understanding about the sequence of the process. The research identifies a common understanding to consider the BMI process a self-learning process that redefines the BM and therefore, the subsequent activities are changed. For instance, through the Naturhouse case study (Sosna, Trevinyo-Rodríguez & Velamuri, 2010) identify a Trial-and-Error process based on experimentation with different BM settings. A similar approach is taken from McGrath (2010) in what it is coined as discovery driven approach. McGrath focus on the well-known thinking "*failing fast to learn faster*". According to this stream, "intelligent failure" are the outcomes that represent new information to learn from and that do not negatively affect the process of BMI, but it is seen as an iteration of experimentation or learning experience. Schneider & Spieth (2013) develop a framework taking into account the firm´s resource-based view and the entrepreneurship perspective. Their framework considers the

incremental development of current BM with the more disruptive development of BMI. Their model suggests an on-going learning process between the BM development and BMI process.

For this research, we want to conceptualize the BMI in order to recognize its different phases with the case study at Infineon. We choose a BMI process that can be easily recognized at the real-life (project) level and therefore, we avoid looking into very abstract processes. We consider a BMI process structured as Sosna et al. (2010), with four different phases; design, experimentation, implementation and, fourth, growth and incremental improvements. In line with the non-linear conceptualizations, these phases do not follow a sequential order but the ongoing learning process defines the position of the BMI in its process. The innovation in firms do not follow a pre-defined order but the on-going learning from one phase might lead to the beginning of the next phase or it can stop it, leading to a back and forth movement until the BMI stabilizes (Sosna et al., 2010).

**Phase 1 (exploration): Design and test**

In this first phase, an employee detects either a new or an old opportunity which seems appropriate to study. There is not much research focusing on how and when BMI is generated. Sosna et al. (2010) sees two common characteristics when incumbent firms begin engaging in BMI: they are reacting to difficulties and the resources required for experimenting are relatively small so they are easily approved. During phase one, Sosna et al. (2010) distinguish that initial development is done with the minimal employee support. Prior knowledge is applied to understand whether the novel BM would be valuable and resilience, “the capacity to recover quickly from difficulties” is needed due to the uncertainty of the novel BM.

The literature on BM design phase is characterized by the development of conceptual frameworks, which aim at capturing the essence of the BM. It focus on uncovering the value proposition for customers and value capturing by the firm, building relationship and involving the necessary infrastructures, technology and finances (Osterwalder, 2004). It is apparent that without a value proposition, it can be difficult to determine how the business can make money. We already discussed, in section 2.3, the two BMI tools available to be use in this phase. Teece (2010) argues that the BM framework has to be well thought before moving into experimentation. Before experimenting with customers, one can engage in testing whether the BM. Few tools help

in this direction, such as the MaRS BM customer validation or BM stress testing (Haaker, Bouwman, Janssen & de Reuver, 2017).

Both beginning and phase ending are fuzzy and unclear. Here, I want to shed some lights about conceptualizing them. The beginning is extremely ambiguous as when managers think of BMI, they have, probably, identified a necessity within the company and they might even already found alternatives. Regarding to the phase ending, in line with Sosna et al. (2010), I propose that the design phase ends when the management supports or gives acceptance to involve, internally, greater resources to the novel idea. This classification would contradict some researches, i.e. Baden-Fuller & Morgan (2010), who assert that the BM experimentation phase divides into theoretical and real-life experiments.

Cavalcante (2013) also distinguishes experimentation from learning, arguing that experimentation is the research over technical challenges and activity deployment. The problem with such classifications is that it is not clear the allocation of the real project in the phases of BMI.

**Phase 2 (exploration): Experimentation**

BM experimentation refers to the fact of pursuing trial-and-error for BMI (Sosna et al., 2010). Academics like Chesbrough (2010) and Amit & Zott (2001) refer to experimentation as the solution to innovate its BM.

Internal and external factors, such as organizational and market variables contribute to the degree of companies experimentation (Kimberly & Evanisko, 1981). There is a growing interest from researchers to understand the influencing factors which lead to BMI. Academics have agreed that IT represents the impulse of BM experimentation and innovation (Amit & Zott, 2012; Baden-Fuller & Haefliger, 2013; Massa & Tucci, 2013; Vorbach, Wipfler, & Schimpf, 2017). Casadesus-Mansel and Ricart (2010) attribute that, generally, the competitive pressure is the main reasons for firm to change their BM. Doz & Kosonen (2010) show that BMI appears due to intense competition and Voelpel, Leibold, Tekie & Von Krogh (2005), in a similar direction, states that BMI is a way to win the intense competition.

The goal of BM experimentation phase is to learn from the different activities and pilot projects to test new settings within a new BM. It normally involves setting small-scale experiments,

selecting few customers and offerings. At this stage, the new BM is tested aside from the current model, sometimes separated into only its own developing team (Markides & Charitou, 2004). McGrath (2010) claims that if BMI needs experimentation, the firm needs to take more decisions based on real option reasoning rather than projected economic value-added concepts. McGrath (2010) points that firms should proactively detect downsides of the BM in order to shift towards different settings. His suggestion is similar to the known “fail fast” in entrepreneurship whose goal is to identify the weaker aspects of the BM before the investment becomes too big to fail.

This phase starts with the experimentation, externally, with customers. For already established firms engaging on real-life experiments, involving customer is risky and, generally, needs to be approved by the management team. Sosna et al. (2010) states that reacting to new learnings from trial-error is crucial to vary your BM. Simultaneously, unlearning process ought to take place in order to reduce cognitive barriers for the novel BM. Generally, in establish firms, phase two would ends with the end of the pilot project.

**Phase 3 (exploitation): Implementation**

During the previous phase, the continuous learning process has shaped the development of an emerging BM. This learning ought to be translated in this stage from an individual or team level towards an organizational level. This phase consists of doing activities that allow institutionalizing the new BM. The establishment of the new BM comes down to change processes, routines, systems and decision-making structures (Sosna et al., 2010). Also, in this stage there is an embracement of the BM into established offerings and customers.

Phase three starts when activities to unfold permanently the new BMI to certain customers and/or offerings are done. This acceptance involves moving forward the institutionalization of the new BM and assets are developed to systematically adapt the new BM. It might happen that the collection of information from the experimentation phase results in already beginning of the implementation phase.

**Phase 4 (exploitation): Growth and incremental improvements**

This last phase of the BMI process refers to the incremental improvement and learning for the model. In addition, keeping the model viable is an ongoing task (Teece, 2010). The objective

is to optimize the output of the new BM and adjust its own development. As the BM settles, the changing environment might challenge the established BM (Sosna et al., 2010).

## 2.5. Barriers for BMI

This section focuses on finding BMI barriers via the literature review of the main papers which touch upon the barriers presented with BMI.

Organizations face substantial challenges and are prone to fail to introduce new BM (Pauwels & Weiss, 2008). The process of BMI has received insufficient research attention (Massa & Tucci, 2013). So far, academics either emphasize on design of BM or focus on experimentation by trial-and-error (Berends et al., 2016). For instance, Chesbrough (2010), points that the experimentation and implementation of BM face significant barriers. He points that those barriers might come from organizational set-ups or from conflicts with prevailing BMs. Other researchers, such as Amit & Zott (2001) on e-business or Aversa & Haefliger (2016) on BM Portfolios, mention that barriers depend on novelty, lock-in complementarities and BMI efficiency. They cover factors that ought to be analyzed when implementing new BMs.

In the RM literature, to the best of our knowledge, we barely identify a research which focus on barriers of RM for manufacturers. The only study we find is Zatta (2016) which points that the main five barriers for introducing RM are (1) a lack of clearly defined pricing strategy, (2) insufficient experience with RM, (3) fear of price decrease, (4) no suitable RM approach identified and (5) a lack of data availability. In this research, we disagree with few of the main barriers. We agree partially on the first barrier. Within big companies, there are many pricing specialists who can develop such projects. The third and fourth barriers are eliminated as this research proposes LTBP as an approach for implementing RM. Under this approach, the risk of price decrease is not existent as seller set the price. We agree with the barriers stated in points two and five as there is no manufacturer using RM or LTBP so it is not possible to observe its outcome.

The table below shows a review of the different papers where potential BMI barriers are explicitly mentioned. We have organized the concepts explained in these papers and we looked into further literature to delve into each of concepts in order to identify potential subjacent barriers.

| Author | Paper | Challenges/Barriers stated |
|---|---|---|
| Chesbrough (2010) | Business Model Innovation: Opportunities and Barriers | Leading change, Conflicts with multi-BMs, Organization ambidexterity |
| Bettis & Prahalad (1995) | The dominant logic: retrospective and extension | The dominant logic |
| Amit & Zott (2001) | Value Creation in E-Business | Lock-in situation |
| Aversa & Haefliger (2016) | Building BM Portfolios: Implications for Strategic Diversification | BM portfolios: cannibalization and substitution effects. |
| De Reuver (2018) | Dual BMs for digital platforms: Why do platform providers operate multiple BM simultaneously? | Cognitive challenges on managing multi-BMs. |
| Massa (2013) | Business Model Innovation | Organizational inertia, management processes, modes of organizational learning, modes of change. |
| Tushman & O'Reilly (1996) | Ambidextrous Organizations: Managing Evolutionary and Revolutionary Change | Inertia: Structural and cultural Cannibalization of the own business |
| Vorbach, Wipfler & Sven Schimpf (2017) | BM Innovation vs. BM Inertia: the Role of Disruptive Technologies | BM inertia |

*Table 1: Literature review on BMI barriers*

The information studied in the table above has been classified into the following three topics: (1) leading change, (2) BM portfolios and organizational ambidexterity and (3) dominant logic, lock-in situations and inertia.

**Leading Change**

Change is crucial to any organization not only to survive but stay competitive and evolve with the business environment (Todnem By, 2005). Leading change in organizational settings falls under the field of change management. A problem comes from relying on C-level management championing a new BM. The C-level employees has probably rose to its position via the current BM, which is now familiar and comforting (Chesbrough, 2010). However, leaders can also be the cause of a delay. Transformations begin when an organization has a new leader who visualizes the need of a major change (Kotter, 1995). McGrath (2010) asserts that "*making*

*BM decisions does fall into the realm of managerial choice*". Therefore, the research proposes the first barrier as *Lack of top management support*.

Santos et al. (2009) defined a theory for accelerating BMI which considers the change on management and executives' behavior. Their BMI-conducive corporation theory claims that corporation should adopt a loose project management strategy where manager have the opportunity to learn and communicate with others. They add that the implicit and explicit knowledge of corporate and business unit managers might present a great gap. Thus, sharing information proactively is sought for stablishing a common vision.

Doz & Kosonen (2010) suggest a leadership agenda in order to enable the capabilities to accelerate the transformation of BM. They build a framework to increase strategic agility, which depends on the strategic sensibility, leadership unity and resource fluidity. The strategic sensibility gives the ability to spot on new opportunities and manage the timely needed to transform the BM. Leadership unity is the ability to make bold and gut-wrenching decisions that call for risky personal and collective adjustment. Resource fluidity is the capability to manage resources and redeploy them rapidly. Furthermore, they also suggest that organizations should be decoupled and modularized to increase the flexibility and to get rid of inertia.

BMI should consider both structural aspects of the formal organization and informal organization dynamics (Santos, Spector, & van der Heyden, 2009). A structural barrier for leaders relates to the established characteristics of their positions. The time-span a manager stays in a position, averaging two to three years, might be too little to pursue major changes (Chesbrough, 2010). This short amount of time can lead the manager to think the option is not persuasive enough. Furthermore, it is possible that the leaders´ KPIs is too focus on generating immediate results, exploitation, instead of exploration. The research defines these two barriers seen on Chesbrough (2010) as: *Leaders´ incentives is too focus on result exploitation rather than idea exploration* and *Management job rotation is too continuous for long-term projects*.

**Managing BM portfolios and Organizational Ambidexterity**

While managing BM portfolios and ambidexterity refer to different ideas, one implies the other and vice versa. Working on different innovative models and solutions comes with a high degree of ambidexterity. Knowing when to shift resources from one BM to the upcoming one might

create division on the organization (Chesbrough, 2010). Managers find themselves in the dilemma of destroying their own work to reconstruct for better suited organizations (Tushman & O'Reilly, 1996). Tushman and O´Reilly add that ambidextrous organizations are needed to simultaneously pursue incremental and discontinuous innovation. Stated by many academics previously, BM portfolio can enjoy from benefits as well as suffering from cannibalization and substitution effects (Markides & Charitou, 2004)(Casadesus-Masanell & Tarzijan, 2012)(Aversa & Haefliger, 2016). It is common that new BM are developed separately from the business units (Markides & Charitou, 2004). This comes with the problematic situation that it has to later be accepted and implemented in the normal team operations. Hence, the research defines the following barrier: *Developing the project separately from the business unit.*

Markides & Charitou (2004) suggest that disagreements on how a company manage two different and conflicting BM depend on specific case. Moreover, cognitive challenges might result from considering two ideas at a time and challenges appear on the BMs that cannibalize on others (de Reuver, 2018). BMI has traits of competency destruction i.e. the loss of jobs or the loss of power for some managers. Competency destruction refers to the innovation which differs from stablish dominant technology and requires a shift in current technology and knowledge skills (Tushman & Anderson, 1986). These challenges ought to be minimized or eliminated. From the text above, we define the following barrier as: *Cannibalizing the established model.*

On other cases, pursuing multiple BMs at the same is advantageous for incumbent firms. Aversa & Haefliger (2016) suggest three types of BM portfolios: independent, complementary and nested. Independent BM are the ones which work in isolation. Complementary BMs are the group of BMs that share relevant synergies. Nested BM are the ones which depend on each other and wouldn´t be feasible to just work with one. A lead time related BM would fall under the category of complementary given the client satisfaction of the new BM could lead to attract new customer and use both BM. According to Aversa & Haefliger, the diversification of complementary BM enhances firm value generation. De Reuver (2018) suggests four motives why firms engage on multiple BMs: as defensive move against competitors, for strategic diversification, for exploitation of new opportunities and as a transitional event towards a new upcoming BM. A dynamic pricing model could fall within the third or four motive to engage on BMs.

**Inertia, the dominant logic and lock-in situations**

The transition of BMs involves many changes to undertake, such as change practices and accepting new structures. This can generate resistance at the firm to change, also called inertia. Firms are unlikely to change their BM unless they obtain strong incentives from it (Vorbach et al., 2017), even in situations where the adaptation need is apparent and known (Saebi, Lien, & Foss, 2017). Vorbach et al. (2017) identifies four different cause which lead to BM inertia: (1) BM as a cognitive pattern, (2) unclear BMs for first-movers, (3) BM interrelations and (4) resource necessity.

As BMs represent mental patterns, firms tend to fit new technologies to current patterns (Tripsas & Gavetti, 2000). This derives from the dominant logic because managers aim at finding new ideas that fit into current high-view operations. The dominant logic is refer to the wisdom which managers know about its industry and organization (Bettis & Prahalad, 1995). The managers' knowledge act as a gatekeeper, leading to a biased view on new BM. As they fall outside of the current and dominant environment, managers fall in the "dominant logic trap" (Chesbrough, 2003). Therefore, the following barrier is defined as: *Bias perception due to current knowledge.*

The second cause is the first-mover uncertainty for new BM. Novel ideas might not show a clear representation of how they effect when put into market which leads to firms sticking with their previous successful BM for longer periods. The barrier is defined as: *First-mover uncertainty*

The third cause (current BM interrelations) refers to the fact that when one part of the BMs in changed, it will change the interaction that its complementary assets, such as bundling products or services and therefore, these other assets must also be changed. This phenomenon is also coined as lock-in. The two factors which contribute in a greater extent to a BM lock-in are the switching costs and the positive network externalities (Amit & Zott, 2001). We define the barrier as: *Lock-in (Requirement to change mindsets and systems).*

The last cause is the resource necessity. Existing resources within the firm are not sufficient to consider alternatives as firms optimize their resource and capabilities with the objective of reducing costs or increasing revenues (Amit & Zott, 2001).The resource scarcity can be both in

economic or knowledge assets. This research defines it as: *Scarcity of resource* and *High resource necessity.*

### 2.5.1. Classification of barriers

Besides an active search of BMI barrier, the research has search for the BMI barrier categorization. Yet, to the best of the author knowledge, it hasn´t been able to detect such categorization within the BM domain. Therefore, the research has extended the search into other fields, such as innovation field, identifying a research which classify innovation barriers as revealed versus deterring (Este, Iammarino, Savona, & Tunzelmann, 2012). Revealed barriers are the ones detected upfront, related to the characteristics of the desired innovation. Deterring barriers are the ones involved as a result of the engagement in innovation (Este et al., 2012). In other words, deterring barriers are the ones related to the process of innovation.

The classification of innovation barriers suggested by Este et al. (2012) fit as a potential classification of BMI barriers. The reason is that, for BMI, it applies the fact of finding upfront barriers, related to the desired new BM and also, during the process of BMI, you might encounter other barriers related to the implementation process. The research author has, therefore, classified the barriers found into revealed and deterred with the surprise that none of them are classified as deterred barriers. The research suggests that this finding might be caused by the fact that research on BMI and BMI as organizational change process is still quite new compared to innovation research.

### 2.5.2. Discussion on BMI barriers

To the best of our knowledge, we haven´t seen a study which pursues an extensive classification on BMI barriers. Therefore, I hope that this research helps creating a sound representation of the barriers which influence the development of BMI. After analyzing the literature, the research identifies that academics might use different wordings to refer to same barriers. The difficulty for classifying barriers is two-fold. Firstly, they are context dependent which means that not all would always apply even if it logically could seem to, i.e. a case lacking of management support because of poor risk-reward ratio but a riskier one has the management support due to other factors. Secondly, the correlation between barriers can be high which increases the difficulty of a clear structure. Using the simple example stated above, lacking of

management support might be a barrier which comes from the poor risk-reward but can also come from other factors and there might also be support although the risk-reward is high.

Four things become clear after the review of BMI barriers. First is that there is not a common identified manner or structure to classify BMI barriers. Secondly, the term barrier is used interchangeably for describing the phenomena or its barrier beyond; an example for it can be the dominant logic, which is the coined phenomena by researchers, and the cognitive bias, which is the barrier beyond the dominant logic. Third deduction is that there is a correlation between barriers, i.e. the risk/reward ratio is not attractive and therefore, there is a lack of sponsoring the project. Thus, finding causal relationship between barriers might be interesting to understand which barriers should be given priority. Such study is a potential follow-up on this research as this research will provide an overview of the most relevant barriers to consider. The fourth suggestion is that the research on BMI barriers needs development focusing on both revealed and or deterred barriers.

The barriers have been organized and they are presented in the following picture.

| List of barriers | |
|---|---|
| Cognitive | Lack of top management support<br>Canibalising the established model<br>Biased perception due to current industry knowledge<br>First-mover uncertainity |
| Structural | Leader´s incentives or KPIs are too focus on results, instead of idea exploration<br>Management job rotation is too continuous to focus on long term projects.<br>Developing the project separately from the business unit.<br>It requires to change too many different parts (Lock-in situation)<br>Scarcity of resource for developing the project<br>Resource necessity is too high |

*Image 4: BMI barriers*

## 2.6. Theoretical framework

The objective of this section is to recap on the finding from literature and provide the basis which will be further analyzed in the next stage, the case study research. Following, the research discusses the main parts of the theoretical framework.

### The BMI process

Section 2.4 analyses the different streams of academics who discuss about the conceptualization of the BMI process. This research considers BMI a forward-looking approach with a fuzzy complex process motivated by the on-going learning within each phase of the BMI. A common conceptualization for researchers is to divide the BMI in Exploration and Exploitation. Following Sosna et al. (2010), we divide the exploration phase in two stages; design and internal test (stage 1) and BM experimentation (stage 2) and the exploitation part in other two stages, implementation (stage 3) and growth (stage 4). A main argument for choosing this conceptualization is its fuzzy self-learning description which is how it is perceived BMI in this research. This research will combine the BM roadmapping with the conceptualization of the BMI process. The hypothesis stated from the BMI process are the following.

- The BMI process helps constructing a more precise BM roadmap.
- The BMI process in the BM roadmapping eases the cognitive requirements to pursue BM roadmapping.

### BMI Barriers

The literature revealed that most of the mentioned barriers are organizational related. Here, it is proposed to divide them into cognitive and structural. Cognitive barriers are those that constrain the minds of employees and structural barriers are related to firm´s stablished practices and assets. Another classification identified which fits to BMI is to classify as revealed or deterred. However, this classification is not meaningful at this point as none of the barriers discussed in literature appear to be deterred.

After analyzing the literature on BMI barriers, we develop the following hypothesis:

- Allocating the barriers within the BMI process helps clarifying the objective and activities to accomplish in each phase.
- Allocating the barriers within the BMI process helps identifying a series of activities to pursue in each phase which in turn facilitate the task of planning the roadmap.
- Understanding the barriers which hinder the applicability of RM is of help to plan the BM roadmap focused on overcoming them.

The image below shows a theoretical BM roadmap where the BMI process has been placed in the horizontal axis as it represents the temporary dimension and in the vertical axis, it is stated the STOF model which separates the activities in domains. Some rectangles contain both the names of activities and barriers, which it simply means that the activity was placed in the roadmap to overcome its related barrier. For instance, Activity A was designed to overcome barrier X.

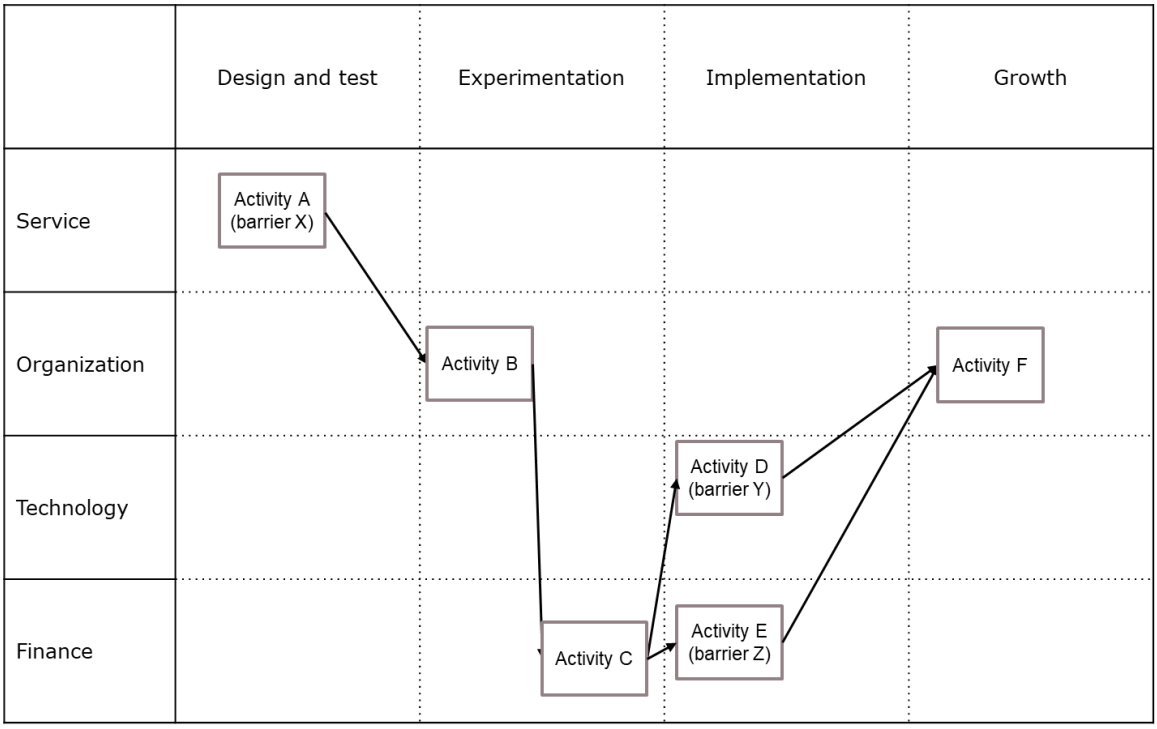



*Image 5: Activities (BMI barriers) along the BMI process in the BM roadmap*

# 3. Research methodology

The research began with the identification of a practical problem; the difficulties for implementing RM and LTBP in the manufacturing companies. Thus, the research looked into scientific research to understand the state-of-the-art knowledge. Following, it was decided to look into literature of BM as a vehicle to steer the implementation of LTBP in manufacturers. By addressing the previous topics, the research question and its set of sub-questions were developed.

To answer the research question, this research is divided into two parts. The first part is the literature review, which has served to build a research framework. In this case, the research framework is form by the identified BMI barriers and the combination of BM roadmapping and BMI process. This theoretical framework represents the basis to build the case study.

The second part, described in this chapter, is the selection of a qualitative case study research as research methodology. The selected case study serves to, firstly, translate the generic BMI barriers to the specific LTBP case. Then, the case study is pursued in order to collect the necessary data to use BM roadmapping for LTBP. The argumentation for the selected research methodology is detailed hereafter.

## 3.1. Qualitative case study research

The following research strategy selected is a qualitative single case study. Qualitative research “serves to inquiry the collection of data in a natural setting sensitive to the people and places under study, and for data analysis that is inductive and establishes patterns or themes” (Creswell, 2007). Thus, qualitative data should be gathered close to where the phenomena is taking place, i.e. better personally than through mail or phone. In qualitative data, it is generally important the contextual setting which the data was created and collected.

Qualitative research is conducted when a problem or issue must be understood further from what is found in literature (Creswell, 2007). The use of qualitative research is because we are dealing with a complex situation where very detailed understanding is necessary. In addition, qualitative methods are one the best methods to develop hypothesis, testing hypothesis and

further following up on quantitative data results to understand the settings and engage in causal theories (Miles & Huberman, 1994).

The qualitative research selected is case study. Case study is an “empirical enquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when boundaries between phenomenon and context are not clearly evident” (Yin, 2009). We support the fact that “truth is relative and dependent on one´s perspective” (Baxter & Jack, 2008) and especially relevant for strategic projects in firms due to firm´s complexity and heterogeneity.

The limitations of case studies are worth discussing. Firstly, it might not be the best tool for generalizing results. However, it does not exist something such as predictive theory in social sciences (Flyvbjerg, 2006). Social science is by nature context-dependent (Flyvbjerg, 2006) and, as described above, case study represent a great tool to produce such knowledge. Moreover the fact that knowledge can´t be generalized does not mean that “cannot enter a collective process of knowledge accumulation” (Flyvbjerg, 2006). Secondly, case study requires a great amount of researcher rigor to avoid biased or misplacing results. Third limitation is that qualitative case studies might not lead to numerical or empirical representations, fact that might hinder the case interest to third parties’ eyes.

Yin (2009) asserts that the suitability of case study depends on three factors: type of research question, investigator´s control over the events and the contemporaneity of the events. Now, we discuss why a single case study is suitable for this research. Yin (2009) asserts that case study ought to be used when the research aims at answering “how” and “why” questions. This research study aims at explaining how the BMI barriers affect the development of RM projects. The fact of studying barriers has a time and contextual-dependency that, as said above, it is greatly captured by case study approach. As the research objective is to build on managers’ perception, a high-level of detail is necessary from managers’ mindset. Furthermore, the need of looking at the case from different perspective and interviewing different role managers leads to a scenario that single case studies is suitable. Comparing single to multiple case study, we argue that while multiple case study allows a comparison between the different cases to observe similarities and differences, our overall objective in this research is to focus deeper on the case. Therefore, the single case study approach is selected. Then, the accessibility to different role managers at Infineon makes it possible to pursue this research methodology.

### 3.1.1. Data collection

The practical goal of this thesis is to design the BM roadmap which helps overcoming barriers for the implementation of Lead Time based Pricing. To do so, the data collection requirements are the following: gain transversal knowledge about the LTBP implementation, discern which generic BMI barriers found in literature review are applicable to LTBP and understand which activities should help pursuing the LTBP implementation.

Given that the knowledge on this research topic is scarce, both at the academic and practitioner level, we focus on interviews as the data collection methodology. As this research considers various dimensions; customers, company organization, technology and financial side, the researcher interviews different role representatives within Infineon. Role diversity is sought in order to obtain valuable and deep insight from experts in the different departments. However, a significant constraint limits the availability of information, the knowledge of LTBP project by few of the current employees. Then, the interviews combine the knowledge from the project with specialists in the different departments in order to combine the researcher knowledge about the LTBP BM and the specialist knowledge expertise which needs to be properly addressed for developing a high-quality LTBP roadmap.

We adopt semi-structured interviews in order to allow room for understanding the problem at stake. The interviews are recorded and later transcribed, preferably before the following interview as with the knowledge gained, we can go into more in-depth knowledge situations with the following interviewees. The table below shows the list of interviewee participants:

| Interviewee | Name | Role |
|---|---|---|
| 1 | Not disclosed | Innovation head |
| 2 | Not disclosed | Innovation PhD |
| 3 | Not disclosed | Marketing & Sales Senior Manager |
| 4 | Not disclosed | Customer Logistics Manager (CLM) manager |
| 5 | Not disclosed | Head of Global Pricing |
| 6 | Not disclosed | Head of Digital Pricing |
| 7 | Not disclosed | CLM senior manager in contracts |
| 8 | Not disclosed | (External) Management Consultant |

| | | |
|---|---|---|
| 9 | Not disclosed | Lead Time based Pricing Intern |
| 10 | Not disclosed | Senior Manager Supply Chain |
| 11 | Not disclosed | Senior Manager Logistics & Contracts |
| 12 | Not disclosed | Project Manager |

*Table 2: List of interviewees*

### 3.1.2. Interview protocol

Considering the objective for this research, we have created a common interview protocol to follow for each of the interviewees. The designed questions focus on the issues, activities and process requirements whose understanding is necessary to create a sound BM roadmap for implementing LTBP. The respondents time availability, around an hour each, is a constraint that affects the interview design. Therefore, the author has prioritized to understand the impact of LTBP on each on the field of expertise of each respondent in order to obtain the maximum amount of detailed and useful information.

Firstly, before going into the interview discussion, the interviewer presents itself and describes the interview details and terms of confidentiality. After the interviewee has accepted being recorded under the conditions stated during the interview, the recording is turned on and the LTBP idea is presented in order to give all interviewees the same level of understanding. Not all interviewees have heart of LTBP previously to the contact with the research author which makes necessary to establish a common level of knowledge. The PowerPoint slides presented to all the interviewees can be found in Appendix A.13.

Following to the introduction, the author presented the same main four questions to every interviewee to start the discussion on the topic. These questions are shown below:

1. Do you think Lead Time based Pricing can be good for increasing profits?
2. What problems / barriers do you see that block the development/implementation of Lead Time based Pricing at Infineon?
3. What activities do you think can help us to develop further the topic of Lead Time based Pricing and get more management support to develop it?
4. How can we change from the current service (free early delivery) to the Lead Time based Pricing?

After each of the previous questions, the interview focused on how LTBP would affect the area of the interviewee expertise by asking the following question:
5. What should we take into account for implementing Lead Time based Pricing regarding your department?
6. How does Lead Time based Pricing influence your work?

The interviewers who took part in the initiative held by Sales & Marketing last year (NLoS&M) were also asked why this idea was put on hold by the board. Before ending the interview, the interviewees are asked about whether there´s an important topic to be addressed and the interview finishes with the following two questions:

- Could you recommend someone to interview?
- Would you like to give feedback about the interview?

### 3.1.3. Data analysis

The data analysis phase begins with the realization of the first interview and it lasts until results are subtracted. In the analyses phase, each interview is transcribed and double-checked for validation. Interviews are not transcribed literally but smartly, meaning that redundant information, semantic or syntactic errors are avoided. Following, the transcripts are analyzed using ATLAS.ti 8.0, a computer-assisted software for analysis of qualitative research. The software facilitates the analysis for unstructured and semi-structured data, such as in this research. ATLAS.ti 8.0 allows the text analysis and assign codes to certain part of the text. The codes will be group together and classified in each defined group. The relationships between the codes define this ontology research. The relationship between concepts is made by the interviewer to lead to findings.

From the data analysis, the research is expected to understand the barriers which influence LTBP and allocate a causal relationship between barriers. Furthermore, the interviews to experts from different departments serves to shape a feasible LTBP business model which is then explained and decomposed into activities for the LTBP roadmap created. Therefore, the research author is the responsible of sorting the collected information and build the roadmap based on meaningful information found by the researcher.

# 4. Company and Industry Profile

This chapter aims at describing the main characteristics that shape the semiconductor industry and the case company, Infineon Technologies AG. First, it is presented an overview of the industry, origins and market characteristics. The second topic covered is the semiconductor manufacturing process. The chapter ends with the company profile and the company motivation to collaborate in this research.

## 4.1. The semiconductor industry and its challenges

In 2017, the semiconductor industry surpassed the 400$ billion market size, valued at 410$ billion (Statista, 2018), having a compounded annual growth rate (CAGR) of approximately 9% since 1987. The major driver for this growth is the technology evolution that requires of semiconductors, also known as “chips” or “microchips”. In the past years, the growth has been fueled by the emergence and widespread of electronic devices. With the electronic devices markets stabilizing its growth rate, Internet of Things (IoT) is expected to provide further future growth. Important IoT trends are autonomous vehicles, 5G and industrial automation. KPMG predicts that the semiconductor market will experience double-digit growth this year, around 15%, maintaining a similar growth the following years.

The impact of the semiconductor industry in shaping technology is enormous. At a first view, the semiconductor is a medium-sized market. However, it represents the bottom-line market (enabler) for other markets such electronics market or automotive and industrial, five and fifty times bigger respectively. In addition, the Fraunhofer institute says that 45% of the economic growth since 1985 came from productivity increase whose main key driver was the evolution in electronics.

From the semiconductor demand side, China is the main market, surpassing Europe and US. China global semiconductor demand is greater than 60%, followed by USA (12%) and Europe (6%) (PwC, 2017). On the supply side, McKinsey shows that China accounts for more than 25% of the industry production and that in both supply and demand China will increase its dominance for the next five years.

### Trade War

External macroeconomic factors play a very interesting role in the industry. The current trade war between China and US led to increase Chinese duty tariffs by 25% in industrial and logistics equipment in US soil. In retaliation, China imposed 25% tariffs on mostly US agricultural goods. The impact of the trade war between the two biggest semiconductor geographical markets is unknown. However, the uncertainty might hinder the growth, especially, if the countries place new tariffs on semiconductor-based products. The consequence of this trade war has already been experienced. On the one side, the companies with higher dependency on China importance saw its stocks values to decrease in higher percentage, e.g. an American designer and chipmaker (Applied Materials and Lam Research) lost 20% of its share price (Hiromi & Masaya, 2018). On the other side, Chinese authorities have held up the acquisition of NXP Semiconductors by Qualcomm (US chipmaker) leading to the expiration time to approve the acquisition.

### Dynamic demand, volatility and Bullwhip effect

Another macroeconomic factor contributing to the already volatile semiconductor market is seen with the Bullwhip effect. The Bullwhip effect describes the event of increased demand variability as we move up the supply chain, from the customer to the manufacturer. As semiconductor companies represent the low-end of the value chain, they operate with high-capacity rates to operate profitably. Therefore, they cannot easily adjust their production rates to demand patterns and this leads to restrictions and bottlenecks from the supply side. In this case, the allocation of produced products become crucial for strategically managing customer satisfaction. It is common to find that those customers with buyer power (high volume of purchases) have a higher priority in the production allocation than those who represent a minor share of the semiconductor manufacturer´s volume of sales.

### Rapid technological development and Moore´s law

In 1965, the founder of Intel, Gordon Moore, forecasted that the size of an integrated circuit would be halved every 18-24 months, leading to double the number of transistors per integrated circuit. Indeed, this forecast is also called Moore´s Law and has been set as a yearly technology development milestone in the industry for the past 40 years. Technological development has led to a very dynamic natural market with products with short life cycles. This means that products

become easily obsolete and they are sensitive to price deflation. Comparing the semiconductor technology development to the automotive industry, with the same level of development, a car would reach the distance to the sun with a gallon of gas (Coppin & Barratt, 2002).

Due to the fast-technological development, semiconductor manufacturers invest heavily in R&D to maintain its competitiveness in the marketplace. Until recently, R&D investment payed off with increased productivity and competitiveness (Backer, Huang, Lertchaitawee, Mantana Mancini, & Choon, 2018), however, diminishing returns are seen lately. One of the consequences is that Moore´s law is expected to not being able to be followed anymore by 2020. Intel has claimed that current silicon-based transistors are about to reach its efficiency plateau and while there are other promising materials and technologies, such as graphene, they are still in a premature stage to take over current technologies.

**Capital intensive**

The semiconductor industry is highly capital intensive. Great investments are required to set up plants and maintain equipment (Cohen, Ho, Ren, & Terwiesch, 2003). Infineon Technologies presented this year its own plan to build a fully automated manufacturing facility for 300 millimeters thin wafers in Austria, leading to a total investment of 1.6€ billions in the next 6 years. This move was pursued after analyzing global trends, like demographic changes, resource scarcity and digitalization driving the market. The 300-millimeter wafers can lead to up to one-half in reduction of production costs. Few semiconductor players are already researching into 450-millimeter wafer production in order to reduce further the production costs.

**Long manufacturing processes and short product life cycles**

The semiconductor industry is considered as one the most complex manufacturing industries (Sun, Rose, Ehm, & Heilmayer, 2015). A network complexity composed with multiple manufacturing sites globally distributed. The manufacturing process itself consists of more than a thousand processes that require longer production time. However, the short product life cycle leads to being a valuable competitive advantage to produce faster. These combined factors urged the industry to develop complex supply chain to optimize throughput. Following, it can be seen an example of the supply chain at Infineon. The image shows the Infineon supply network and complexity of the industry.

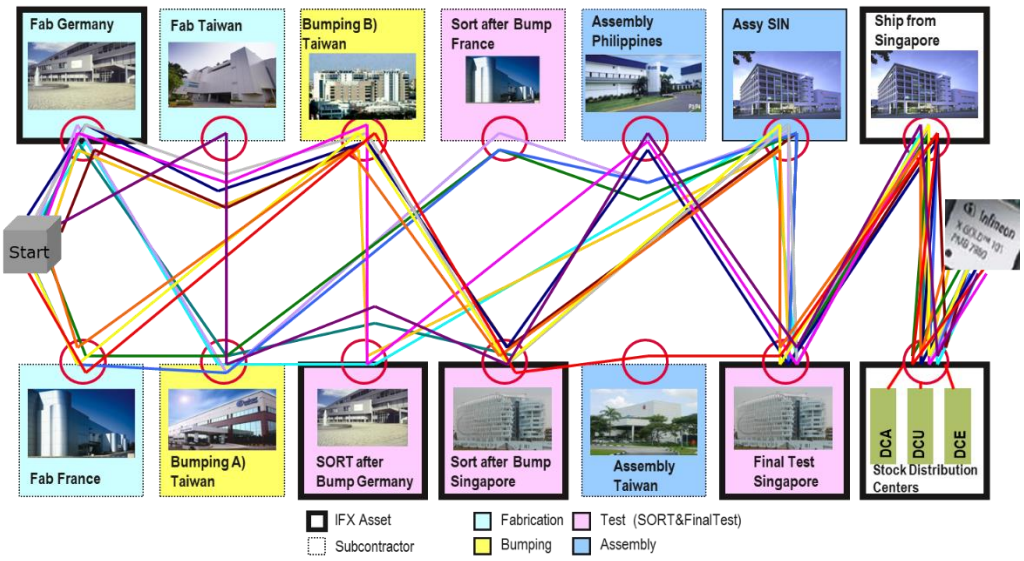



*Image 6: Infineon Supply Chain distribution for a business division (Infineon Technologies, 2016).*

## 4.2. Supply chain production of a semiconductor

Two main parts split the production process, Back-End (BE) and Front-End (FE). Between these two production stages, there is the Die Bank that is the warehouse for semi-finished goods produced in the first stage, the Front-End. Normally, the Front-End part is characterized to produce semi-finished goods that are very standard (not customized). For a significant number of products, the specifics of technological properties (customization) are made at the Back-End process. In case, the chip customization starts in the Front-End cycle, manufacturers will generally manufacture the good upon request.

The level of semi-finished goods produced by a manufacturer depends on the external demand, the manufacturing characteristics of the good and the manufacturer strategy. For the external demand, a stable demand can lead the supplier to produce before an order is placed. For the manufacturing characteristics of the goods, the customization level plays an important role. A high customization level means that the good is very specific to certain customers, and, therefore, the manufacturer would start the production after the order placement because the irregularity in demand. The manufacturer strategy depends on order management and warehouse factors. The three general strategies are seen and described in section 2.1.2: MTO (Make-to-Order), ATO (Assembly-to-Order) and MTS (Make-to-Stock).

The total manufacturing time lasts up to four months and it is divided into the more time-consuming part, FE processes, which take up to 13 weeks and BE process that last for four

weeks. The semi-finished goods are stored at the Die Bank that is the warehouse for FE produced goods. In the FE side, the chips are fabricated in wafers, which are silicon substrates of 100-300 millimeters of diameter. A wafer of 300mm contains approximately 500 chips. The wafer is tested and stored at the Die Bank. For the BE cycle, the wafer is wired and cut into chips. Chips are tested and packaged. Test can last up to one week depending on its technology properties and application. Eventually, chips are stored at the distribution center and a ready to be ship to customers. The following figure shows the manufacturing processes for a semiconductor player.

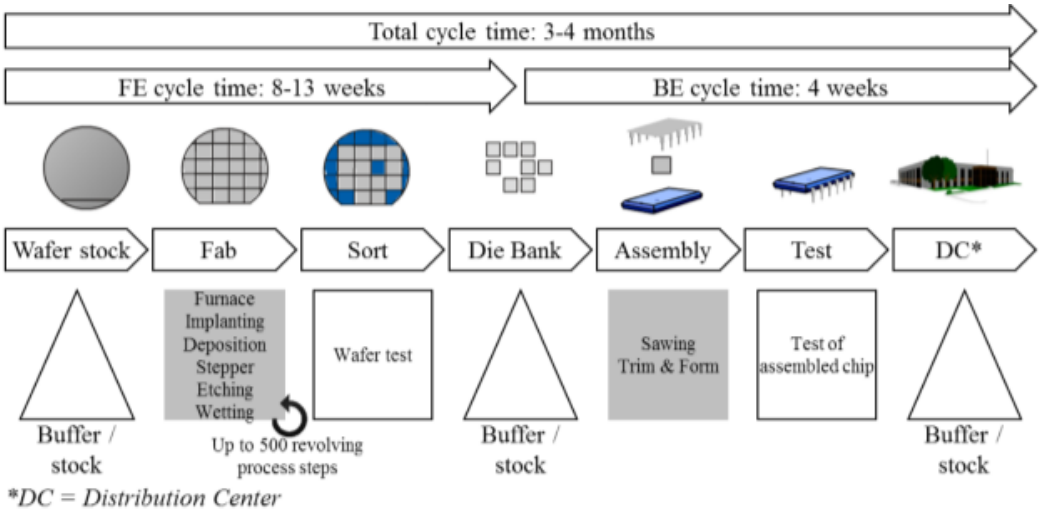



*Image 7: Manufacturing process for a semiconductor player* (Ehm, Schiller, & Ponsignon, 2011).

## 4.3. Infineon Technologies AG

Infineon Technologies AG is a leading German and European semiconductor manufacturer with approximately 37.500 employees and 7€ billion revenues in 2017 (Infineon Technologies AG, 2018). By revenues, Infineon is the second largest semiconductor in Europe, behind NXP. Globally, biggest semiconductors are Intel and Samsung, with 56$ and 44$ billion in revenue in 2017. Infineon was founded and became an independent entity from a Siemens spin-off in 1999.

The company operations are divided into four divisions: Automotive (ATV), Power Management & Multimarket (PMM), Industrial Power Control (IPC) and Digital Security Solutions (DSS). The following figure shows the revenues shares for each division. Note that Chip Card & Security (CCS) has been renamed to Digital Security Solutions as of September 2018.

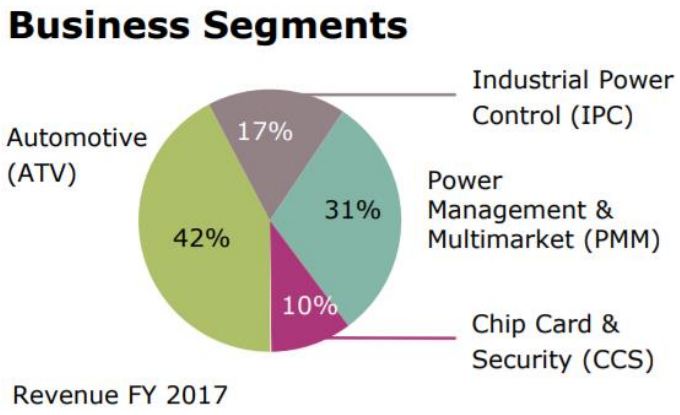



*Image 8: Business revenue shares at Infineon (Infineon Technologies AG, 2018).*

The product portfolio is very diverse compressing sensors and microcontrollers, system solutions and power semiconductors in all divisions. In the Automotive market, in which Infineon is market leader (Infineon Technologies AG, 2018), Infineon chips support mobility solutions, such as electric and hybrid card and high-speed trains, chips for automated driving, energy management solutions and data connectivity. In Industrial Power Control market, Infineon delivers chips and microcontrollers for home appliances, renewable energies and mobility solutions. The Power Management & Multimarket division focuses on power management solutions, radio frequency and sensing controllers and provide chips for industries who are in need of high reliable chips, such as space, defense, medical and high temperature and heavy industry. The Digital Security Solution division offer chips for Smart Cards and embedded security solutions (Infineon Technologies AG, 2018).

To the focus on innovative high-tech products and services, Infineon is also committed to sustainable energy efficiency solutions. It has been listed for eight consecutive years in the Sustainability Yearbook, made by RobecoSAM, a company focused on investing in sustainable solutions. In addition, it has continuously been listed in the Dow Jones Sustainability Index since 2010 (Infineon Technologies AG, 2018), and promotes the business ethics and human rights.

### Infineon Supply Chain

The SCOR, Supply Chain Operations Reference, model is the unique management tool used at Infineon to manage the volatile demand and effectively manage the supply chain operations. It comprises from the supplier´s supplier to the customer´s customer and its objective is to focus on the activities associated and needed to satisfying the customer demand. The

Association for Operations Management, with over a thousand members, is the SCOR model supporter and acts as enterprise advisor (Yachi & Gassel, 2015).

The five main processes of the SCOR model are Plan, Source, Make, Deliver and return. The Source consists of organizing the company procurement activities, from raw materials to preassembled goods. Additionally, it covers the distribution of such materials and quality checks before its production. Make covers the production phase. Deliver process is aimed at managing and fulfilling customer orders. The process is meant to effectively respond to order request, bringing the order to the customer as efficient and effective as possible. The Return process concerns on both supplier and customer side, returning raw materials or receiving finished goods from customers. Generally, the return of orders is due to a failure in the production and delivery activities of the supplier. The Plan process includes planning all the necessary activities in Source, Make, Deliver and Return processes.

This master thesis study focuses on the maximization of revenue via the monetization of the Order Lead Time. This new factor will influence both the supply and demand practices. In the supply side, the early delivery supposes that Infineon has to ensure its reliability. In addition, given a profitability increase, Infineon might be tempted to further increase the supply of lower lead-time deliveries. In the demand side, the monetization of the lead-time might change the customer behavior of ordering. Given the order price increase, there should be a general trend for delaying the wished lead-time, and therefore, order for shorter lead-time only when it is strictly necessary. Customer would also be more demanding in meeting the delivery requirements as higher price is paid for an early delivery. As a result, the Plan activities (depicted in Figure 6), especially the subprocess Order Management, will probably experience changes.

## 4.4. Revenue strategy at Infineon[3]

Infineon has grown at a yearly rate of 8% in the last fifteen years and it is forecasted that revenue growth will stabilize. Therefore, Infineon strategy is two-fold: sell more of the current products and create the right products. To accomplish sales increase strategy for current

[3] Information obtained internally at INFINEON.

products, there are two key factors for Infineon. First factor is to increase the penetration rate in current markets and customers. The second factor is to expand the customer pool via enabling effective communication and distribution channels. In order to create the right products, Infineon has three factors playing a crucial role. First, leverage its know-how to develop efficiently new products. Second, create innovation to drive changes in the market. Third, complement products with support and tools to fastly ramp up and mass-produce in all customer categories.

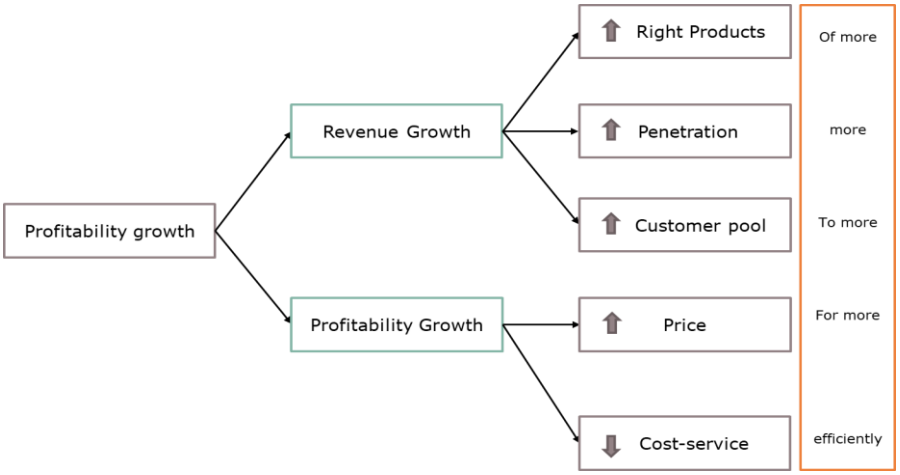



*Image 9: Revenue strategy at Infineon*

In order to accomplish the profitability goal, Infineon has designed a series of projects, which are specific, measurable and action-oriented. These projects include leveraging the power of digitalization and data analysis, strengthen marketing, improve cross-selling and build in-house talent, amongst others. The initiative of next level sales and marketing (NLoS&M) groups these projects.

## 4.5. Company motivation in this research

The case study company is highly interested in the outcome of this research for two reason, one related to the LTBP roadmap and the second related to the BM roadmapping approach.

LTBP is an attractive alternative for Infineon given the fact that targets profitability growth via increasing the price and the profit margin. LTBP idea was presented at NLoS&M initiative but it was not successfully selected to become part of the supported projects to develop. The reason is that there are still certain barriers to be addressed before top management gives support to the

new BM. Therefore, the elaboration of a roadmap focusing on barriers found within Infineon is highly valuable for the case study company.

The second interest comes from the Innovation department at Infineon which is the department in collaboration with the research author. The innovation department goal is to develop disruptive technologies, services and BMs. Therefore, the learning and acknowledgement of BM roadmapping is not only useful for LTBP but it can serve for the initial development of other promising ideas.

# 5. Analysis of results

This chapter provides an analysis of the case study findings. The interviews results have different objectives. Section 5.1 discusses the reasons why LTBP was not transformed into a project under the NLoS&M initiative in Infineon. Section 5.2 discusses the different barriers found during the interviews´ analysis. Section 5.3 explains the factors affecting the implementation of LTBP. The following table shows the domains covered by each of the respondents during the interviews.

| Interviewee | Service | Technology | Organization | Finance |
|---|---|---|---|---|
| 1 | ■ | ■ | ■ | ■ |
| 2 | ■ | ■ | ■ | |
| 3 | ■ | | ■ | ■ |
| 4 | ■ | ■ | ■ | |
| 5 | ■ | ■ | ■ | ■ |
| 6 | ■ | ■ | ■ | ■ |
| 7 | ■ | ■ | ■ | |
| 8 | | ■ | ■ | |
| 9 | ■ | ■ | ■ | ■ |
| 10 | ■ | ■ | ■ | |
| 11 | ■ | | ■ | |
| 12 | ■ | ■ | ■ | ■ |

*Table 3: Domains of discussion covered during the interviews with the interviewees*

## 5.1. NLoS&M initiative and Lead Time based Pricing.

NLoS&M (Next Level Sales & Marketing) initiative took place in mid-2017 and it was the kick-off for the Revenue Strategy in Infineon, see section 4.4. During this time, an external consultancy firm supported Infineon in the presentation of ideas, one of them being LTBP. The outcome was that the idea was rejected to become a “sprint” project and it stopped being developed.

Initially, this research aimed at interviewing each of the parties involved in the NLoS&M initiative; someone from the Sales and Marketing director (SMD) board who were the responsible for taking decisions, the innovation team who were the champions of the idea and the external

consultancy firm who was responsible for organizing and presenting the ideas. Unfortunately, at the last minute, the interviewee in the SMD board could not join the interview. Therefore, this research has obtained and analyzed the information from two interviewees in the innovation department, Interviewee 1 and 2, and from an external consultant who helped the innovation team and presented the idea of LTBP to the SMD board, Interviewee 8.

The question posed to these interviewees regarding the NLoS&M was "*Which are the reasons why the Lead Time based Pricing idea was not selected under the umbrella of NLoS&M?*". The reasons given by interviewee can be grouped as LTBP related and non-LTBP related. Regarding the non-LTBP related, the three interviewees referred to the fact that the scope of the NLoS&M initiative was not the right one for LTBP. *Pricing as such was not an initial priority topic under NLoS&M and the clear objective given by senior management was to finish the already running modules, some of them being considerably delayed* (Interviewee 8). Furthermore, Interviewee 8 add that foundational pricing issues, such as setting of appropriate price lines or list prices, need to be firstly addressed before going into next generation of innovative pricing ideas such as LTBP. Interviewee 2 made a similar claim as he asserted that LTBP was not the type of project to successfully undertake within two months and that it did not fit into the objectives of NLoS&M initiative. Regarding to the LTBP related reasons for not being selected, Interviewee 8 asserted that IT systems and infrastructure readiness was questionable, at least, from an initial high-level analysis done at Infineon. Interviewee 1 asserted that being such an undeveloped idea to the industry, we would have to "break greater walls".

To sum up, it is seen that two main factors blocked the implementation of LTBP. For non-related to LTBP, the window of opportunity was not in place as management interest focused on other more foundational topics rather than pricing. Related to LTBP, the factor was that an initial readiness of LTBP in Infineon systems was questionable.

## 5.2. Analysis of barriers

This section discusses the barriers found for LTBP. The objective is, firstly, to validate that generic barriers found in BMI literature are also referred to LTBP. Following, the analysis also allows to find barriers which were not found in BMI literature but are considered important for LTBP implementation. The barriers finding process is comes from the analysis of results,

especially when respondents were asked to point the issues, problems and barriers for LTBP. Section 2.5.2 already pointed the difficulties for finding and classifying barriers. The researcher has proactively analyzed the data and, to avoid bias, it has considered adding barriers when more than one respondent referred to the identified barrier. The validation and finding of barriers are supported with the grouped quotes using ATLAS.ti 8.0 and they are stated in Appendix C.

After the barrier identification in section 5.2.1, the researcher elaborates on the causality of barriers, in section 5.2.2, and proposes to classify them in two levels: level one being the critical barriers and level two being the supportive barriers that affect the level I barriers. The causality of barriers takes into account the relationships between the barriers posed and it is done through researcher own interpretation after having identified the barriers from the data analysis.

See below a table with the number of respondents who referred to the defined barriers.

| **Barriers** | **Respondents** |
|---|---|
| Industry Supplier-Customer relationship | 3 |
| IT system complexity | 6 |
| Value perceived barrier | 5 |
| Lack of top management support | 5 |
| Company mindset | 5 |
| Cannibalization of the BM | 3 |
| Biased perception | 4 |
| Developing the project separately | 3 |
| First-mover uncertainty | 3 |
| Lock-in | 4 |
| Resource allocation | 2 |

*Table 4: Respondents referring to each of the formulated barriers*

### 5.2.1. Barriers associated to LTBP

**Industry Supplier-Customer relationship.** Infineon has traditionally focused on good supply for the automotive market in which it is the market leader. In automotive market, the relationship supplier-customer is truly important and therefore, it is normal that supplier *"needs to do whatever to support the customer"* (Interviewee 12). In automotive market, "*you cannot ask for money to order when they need it because there is a whole different relationship*" (Interviewee 12). Two reasons for these strong bonds in the automotive market are that the customer are very important customers and Infineon has developed R&D partnerships with many of the players. In the other two business units which LTBP is applicable, "*it's very interesting because we have a*

*lot of distributors and they play the same game with us. If we do not have the product then they just go to another supplier*" (Interviewee 12). The quotes regarding these barriers are found in Appendix C Table C.2.

This research, in section 2.1.4, refers to the issue of pricing fairness. Customers tend to dislike dynamic pricing, especially when the feeling is an unjustified price increase. One of the factors to understand pricing fairness would be to understand the business relationship between parties. For instance, as Infineon is already providing the early service for free, few interviewees agree that charging them would be seen as unfair. Therefore, in order to avoid this situation, Infineon should begin delivering the products on the contractual lead time before engaging in LTBP.

**IT system complexity.** A barrier which is highlighted and specific to the semiconductor industry is the IT systems complexity. The semiconductor industry is one the most complex manufacturing industries (Sun et al., 2015) and the delivery date is crucial to avoid stops in customer production lines. Therefore, many systems and contracts are in place regarding the commitment of lead-times leading to a development of complex network of supply chain IT systems whose goal is to deliver on customer wished dates. The adaptation of LTBP within this complex structure is not easy to achieve for two reasons, the complexity itself of the IT systems and the need to change many systems. Table C.3 shows the quotes where IT complexity is deducted.

**Value perceived barrier**. A barrier that had not been identified in the literature. The value perception barrier is associated as organizational barrier because it is the perception that employees have of LTBP. Five respondents talked about the perceived value of LTBP. Out of these five, the two belonging to CLM perceived that Infineon needs to ensure a % of LTBP for the customer i.e. committing even higher than what is already being committed with LTBP. Interestingly, the other respondents whose goals are farer than CLM´s customer satisfaction, regard to LTBP as an interesting idea. There is a contradiction in the argumentation of these two groups of participants. The difference lies on the fact that different roles will have different objectives i.e. CLM objective is customer satisfaction while marketing objective is increasing profits. Thus, this research argues that value perceived is influenced by the interests of the

different roles and departments that employees belongs to. The barrier from the value perception comes from the belief of the CLM respondents that Infineon will be demanded an extra effort to apply LTBP. The quotes are seen in Appendix C Table C.4.

**Lack of top management support.** At Infineon, LTBP has not needed early management support as it is been developed within innovation department and it will be further developed for the Safe DEED EU funded initiative. In a later development stage, it will be needed the management commitment as this project needs collaboration from different departments and a strong support or “vision” (Interviewee 2) to succeed with its implementation. Table C.5 show the quotes regarding to top management support. Three quotes relate the lack of management with Infineon´s long-term strategy vision or mindset of being very customer supportive.

For other manufacturers, LTBP needs initial funding to be tested. Therefore, it is difficult to pursue LTBP without the support of a sponsor who can allocate resources.

**Company mindset.** The relationship between strategy and BMs is discussed in section 2.2. At Infineon, the strategy is to be customer friendly which is believed to result in a competitive advantage; “*We are very customer focus and customer friendly. This is a competitive advantage because customers know we won´t let them down*" (Interviewee 10). This strategy is transferred top-down to employees who act on line with the strategy, creating a mindset. Therefore, the greater is the mismatch between LTBP and company mindset, the greater will be this barrier. The quotes are seen in Table C.6.

**Cannibalization of the BM.** Cannibalization is seen at a conceptual and product level. At a conceptual level, respondents classify Infineon as a customer friendly and supportive company. Applying LTBP implies that if customer would not pay, Infineon wouldn´t deliver earlier than contractually stated. Therefore, Infineon would be cannibalizing its conceptual image as customer supportive.

At the product level, cannibalization is voluntarily pursued for a selection of products and customers. However, few respondents fear that customer might threaten to terminate its whole business with Infineon because of LTBP dissatisfaction. At an initial stage, there is no reliable

information about customer reaction, therefore these barriers have to be taken into consideration. Interviewee 2 suggest that customer might demand to apply LTBP to other non-LTBP products. Similarly, interviewee 12 suggest that customer will demand assurance of LTBP for a % of the orders. If Infineon would not possibly meet expectation, cannibalization could be the outcome from a business perspective. Therefore, as long as the customer reaction is not clear, the cannibalization represents a cognitive barrier to pursue LTBP.

**Biased perception due to current knowledge.** A bias on current practices and systems is suggested from different quotes. Firstly, some interviewees assert to look on what competition is doing in order to evaluate whether this opportunity can be feasible. Secondly, it is also detected that interviewees talk from the past experience, for instance, referring already that Infineon does not have favorable experiences at applying similar concepts. Even, one of the interviewees classified this project as another logistics project to secure supply.

In general, it can also be perceived a tendency to fit the LTBP idea under the settings and practices of the semiconductor industry. Under these setting, interviewees see difficulties for applying such concept and they avoid comparisons with the airline or hotel industry i.e. *"I understand it is so much easier to do this RM for the airline or hotel industries"* (Interviewee 5). One of the interviewees reflect on the bias arguing "*a tricky part I see is that no one is doing it and if no one is doing it, does it mean that it is very innovative or that it is very difficult*" (Interviewee 9). Table C.8 shows the quotes referencing to this barrier.

**First-mover uncertainty.** This barrier was hardly being mentioned by the interviewees as it involves knowing whether competition is involved with such practices. Differently to the other barriers, this one was consciously asked to interviewee 1, 2 and 9 as these interviewees had been involved with LTBP to some extent, therefore, they had the knowledge that this idea is new in the market. They all agreed that first-mover uncertainty was a barrier for them. Therefore, this research suggests it to be considered.

**Developing a project separately from the Business Unit (BU).** The identification of this barrier was referred by two of the respondents who belong in the innovation department. While other respondents might had not thought about the ownership of LTBP, the ones working at the

innovation department referred to this barrier. The development of this project by innovation team means that innovation lacks of specific expertise and product ownership to champion the project. For the BM success, there needs to be a takeover by specific department at some point during the development. As long as innovation department is the sole responsible for LTBP development, it will be difficult to be successful. The quotes from the two interviewees can be read in Table C.9.

**Lock-in situation.** This barrier is the combination of the long-term strategy of a firm (mindset) and the established systems made to support such mindset. At Infineon, there is the strategy to be customer centric and, therefore, the developed systems are optimized for it i.e. Infineon allocation is optimized for customer needs rather than profitability. This situation collides with LTBP as the mindset and system is focused on optimizing profits while the current mindset and systems are focused on increasing customer satisfaction. Interviewee 10 refers to the lock-in situation as "*The second barrier I want to mention is our systems. I guess you already noticed in your research that we have a customer friendly attitude and this is supported by the systems we have in place in Infineon*". In Table C.10, it is stated the quotes where it clearly refers to the lock-in situation.

**Resource necessity and allocation.** In order to assess the suitability of LTBP, companies need to make initial investments (see chapter 6). As stated by Interviewee 1, it is not so trivial to develop a LTBP tool and it requires considerable time and thinking period, see Appendix D. Therefore, this opportunity could had been discarded from the beginning given the already discussed barriers. In Infineon, this barrier does not exist given the organizational structure, i.e. LTBP is develop in the innovation team and it is supported by an EU funded project. Therefore, while it is not a significant barrier at Infineon, it can certainly be for other manufacturers. Especially, for smaller firms it can be a higher barrier than for big firms as the LTBP necessitates of the same development regardless of the company size.

### 5.2.2. Causal relationship between barriers

This section builds a causal relationship between the barriers identified from the case study. The researcher, through own interpretation, has inferred the barrier relationship based on the meaning of the barriers and the information collected from the case. The correlation between

barriers is detected and introduced in ATLAS.ti. An ontology was created with ATLAS.ti 8.0 and it is presented with Image 9.

To build an ontology between barriers, the researcher started identifying that not all barriers might be present when a BM fails, see section 2.5.2 for a discussion on the BMI barriers. The research author identified causality between *Lack of top management support* and the others identified barriers. All the other barriers can be the cause of *lacking management support*. Therefore, the *lack management support barrier* is a consequence of the other barriers presented in this case.

Other barriers present correlations. The *lock-in barrier* shows correlation with three barriers. *IT systems complexity barrier* will influence the *lock-in barrier* as the higher the IT system complexity, the higher will also be the *lock-in barrier*. The perceived value barrier will also influence the importance of the lock-in barrier because it is greater for those who don't see the benefits of the new BM. Finally, the *company mindset barrier* also influences the *lock-in barrier* because a mindset mismatch with the new BM leads to greater lock-in situations. Similarly, the *bias perception barrier* is associated to the *company mindset*, the *perceived value,* the *current Supplier-Customer relationship* and causes to some extend the *lock-in situation barrier*. The relationship for each of the barriers was introduced in ATLAS.ti 8.0 giving form to the ontology which can be seen below.

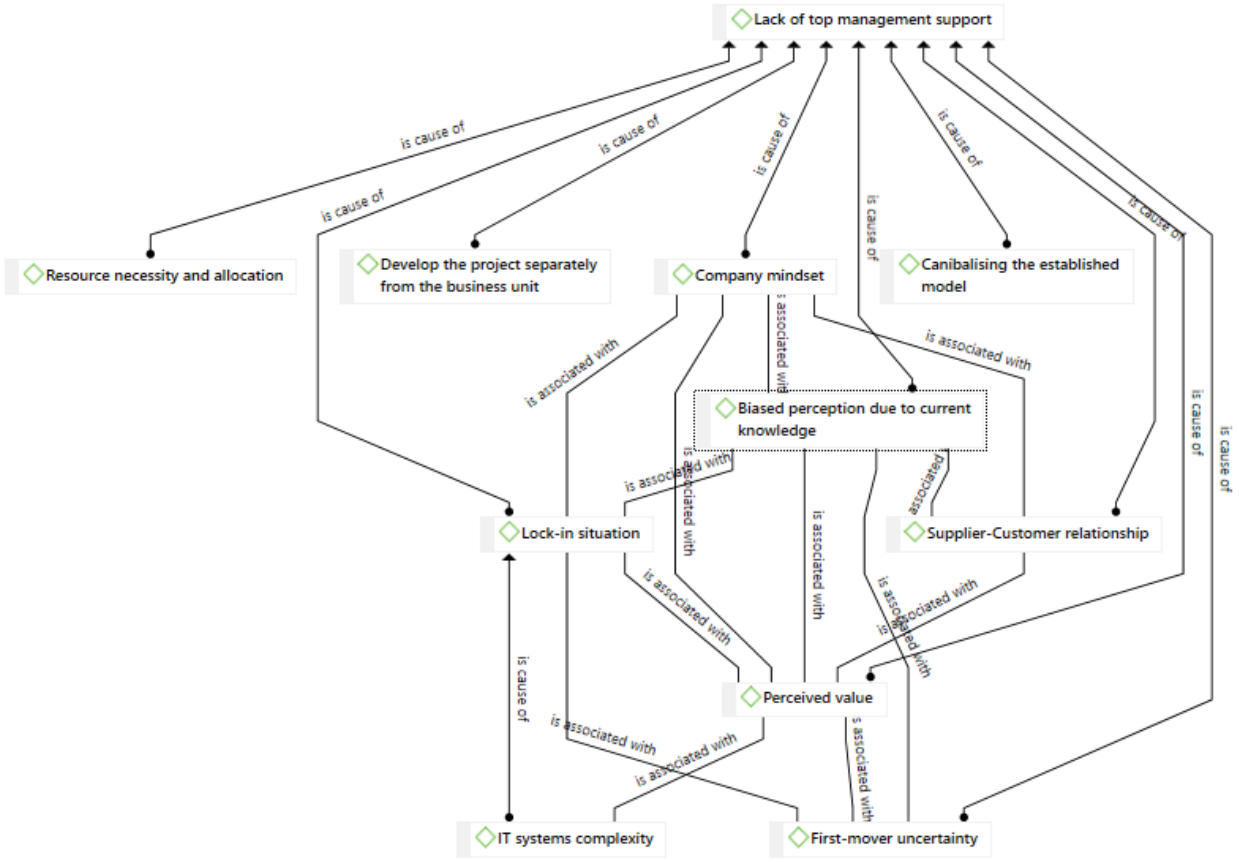



*Image 10: Hierarchical (Bottom-up) view of the correlation between barriers with ATLAS.ti 8.0.*

The ontology visualization shows two interesting points. The first one is that the management support barrier is always consequence of other presented barriers. The second one is that there is a high degree of correlation between the following barriers; Lock-in situation, perceived value, bias perception, company mindset and supplier-customer relationship. This means that the provenance and barrier strength depend on each other.

From the visualization of the relationship between barriers, the researcher proposes a barrier classification, between level I or critical and level II or supportive. The research author defines that critical barriers are the ones which directly hinder the applicability of BMI, in this case LTBP. To make it clear with an example, the critical barriers are the ones which are always presented when a BM fails. These “always” presented barriers relate to the project stakeholders who are in control of the decision-making. Therefore, the barrier categorized as level I or critical is the lack of top management support. There might or not be supporting barriers such as lock-in barrier, cannibalization fears, etc. The supporting barriers are the ones which influence on the

level I barriers and do not need to be always present. However, it is also logic to argue that if a BM isn´t developed, from the firm´s side, a barrier which is always present is the lack of management support. In other words, the barrier of lacking management supports does not need to be a barrier per se and the reason for lacking of management support point towards what this research calls supportive barriers. To conclude on what is a level I barrier, it can be stated that level I barriers are the ultimate and direct resultant barriers for the development of BMI.

## 5.3. LTBP related factors

This section analyzes the data and focuses on finding significant contextual factors influencing the barriers presented in section 5.2. The goal is to go beyond barriers and understand under which circumstances LTBP shows limited barriers. After analyzing the data collected, the full allocation situation is the main factor affecting significantly LTBP.

**Full allocation situation.** The so-called allocation situation refers to the fact that customer demand exceeds the market supply. This situation is not easily sorted out due to already mentioned factors (section 4.1): high utilization rates to be profitable, three quarters to increase production capacity and the semiconductor market volatility which prevents semiconductor manufacturers from increasing production capacity. Due to the current market prosperity, semiconductor industry is in full allocation and it is expected to be maintained at this level for the next 12-18 months (Interviewee 10).

In Infineon, the allocation period came with the management decision that more money had to be made and it was a priority, for the different business units, to increase profitability. In these settings, profit maximization projects, such as LTBP, gain attention as an innovative alternative to increase revenues and steer demand behavior. Thus, internally, the allocation situation has opened the windows of opportunity for profit optimization project such as LTBP.

Furthermore, in allocation periods, contractual order lead-times are long which leads to the need to place customer orders quite early in time. Unexpectedly, extra demand for shorter than agreed lead-time might be required and LTBP could capture the economic value of it. Besides, customer can´t change the supplier as it wouldn´t get the parts either elsewhere meaning that

customer has to accept LTBP willingly or not. Therefore, externally, the allocation situation also leads to customer accepting LTBP which means that the introduction of LTBP should be less refuse from customer during allocation situation.

# 6. Synthesis of findings: BM Roadmapping

This chapter uses the BM roadmapping approach, from de Reuver et al. (2013), combined with the BMI process and the BMI barriers in order to develop a LTBP roadmap at Infineon. This roadmap is especially useful for Infineon as it is based on its contextual situation, business and barriers found in this research. However, the roadmap should also serve for those manufacturers who would be interested in applying RM but they don´t know how. The roadmap reflects both the main important actions to tackle, as well as, more concrete and detailed activities regarding the specific case study company.

The construction of the roadmap comes from the researcher knowledge gained during the interviews. The interviews had the objective to gather a deep understanding on the impact of LTBP in the different roles/departments and understand the barriers posed at an enterprise level. The roadmap construction itself was not asked to the interviewees as the researcher's goal was to gather the maximum amount of relevant information within the time given for each interview. Therefore, the researcher focused and took into account the opinion of experts on their field of expertise in order to build the roadmap, avoiding the discussion about fields which respondents had little experience.

The BM roadmapping proposed by de Reuver (2013) comprises four steps. The first step is to identify desired changes in the BM. It represents a high-view explanation of the new characteristics of the BM. The second step is to analyze the impact of the desired BM changes. This step represents a closer look into the practices at Infineon and it discusses the impact of the introduction of the desired BM. The third step is to translate BM changes into specific activities. For this step, the research needs to look back at the data collection and build a series of activities regarding the organizational change required to implement LTBP. The fourth step is to make back-casting of ideal transition path. This means that activities are sequentially build in order to plan the optimum roadmap. The BMI barriers are taken into account for the step 3 when activities ought to be designed. The BMI process is used in steps 3 and 4 when the research classifies the activities within the BMI process. Following, the research explains each of the four steps.

## 6.1. Identification of the desired changes in the BM

LTBP is a RM strategy which aims at charging a higher price for the products that are early delivered in respect to the standard (contractual) lead time. Charging a higher price for early delivery has advantages such as steering demand towards less volatile demand and, therefore, increasing the supply chain flexibility. Considering the blocks from the STOF model, LTBP affect directly the service domain as it changes the value proposition and the financial domain as it changes considerably the way revenue is made.

The LTBP opportunity becomes visible from the digitalization of manufacturers´ supply chains. Therefore, the technological systems are enablers for LTBP. In the technology domain, there needs to be an assessment on whether LTBP can be integrated in the systems. The degree of technological change depends from the current technological systems and also on the extent of development which is desired to achieve. This second factor also influences the organizational and financial domains. The organizational domain also revolves on the LTBP development, i.e. to what extend it will be systematically applied. In the organization, the implementation of LTBP will change the way supplier and buyer do business and therefore, there is a learning process to ensure the perfect functioning of LTBP and the success of the LTBP BM.

As LTBP is a pricing strategy, the financial domain is also considerably affected. The revenue scheme is increased. The cost of implementation depends mainly on the effort needed to complete the technological change require which should be studied. For instance, a cost-benefit analysis should value the implementation of LTBP in economic terms.

## 6.2. Analyze the impact of the desired BM changes

This section explains the impact of LTBP on the case study company through researcher's own interpretation from the data collected. Below, for each of the domains of the STOF model, the research explains the impact on the main concepts in each domain.

### 6.2.1. Service domain

This section describes how applications for LTBP impact the service provided to the customer.

**Value of the service**

The value of the LTBP service is based on the introduction of the order lead time as a monetized factor. The supplier charges a price adder to the customer for earlier than contractually stated delivery. LTBP should, theoretically, optimize supplier profitability and steer the demand to be more stable and less volatile. The value for the customer is that the supplier delivers the product on its wished date rather than on a contractual lead time date and therefore, this situation is economically and non-economically advantageous.

All interviewees supported the value of LTBP service for customers in the semiconductor industry. Given the long production times, suppliers have to produce according to forecasts rather than real orders. Delivering the products on the customer wish date, sometimes much earlier than what is contractually stated, provides great benefits. Often, having to deliver earlier to one customer impact the delivery on other customers generating extra workload in order to reschedule all the other orders. Another situation is that delivering earlier for its own sake (without customer requesting for it) does not necessarily imply that the service was better. An example of such case would be if the customer receives the order when its warehouse is full. This would not only imply that the customer would have logistic issues but also the fact of having to pay earlier for the order.

Infineon is customer driven. If by any chance Infineon has the possibility to accomplish customer desires, it will do so, and it will do it freely without requesting any compensation. Therefore, Infineon ought to move from current state, which is a free, faster and better delivery towards having it as a paid service. All interviewees refer to this situation as key difficult for implementing LTBP. Given the current settings, few interviewees agree that customer would rarely understand the reason of paying for something they have been receiving for free. Interviewee 1 suggested to take away this free service in the first place. Interviewee 1 suggests that Infineon does not even have to communicate such action to the customer as they are contractually not obligated to deliver earlier. Furthermore, interviewee 1 suggests that the creation

of a platform, such as Airbnb or Booking would be the trigger for customers to accept the change about how business is done. Interview 1 argues

"*This is nothing special in my opinion because it happened for the hotel industry, airlines, etc as before they had all the same prices but with the introduction of a platform, the price became dynamic and customer got used to it*."

Interviewee 1 also suggest that by making such platform anonymous, the customer would not be able to complain. Contradictory arguments are given from other interviewees. Interviewees 4 and 11, both in CLM roles, suggest that customer will not accept changing practices unless Infineon is giving extra value. Interviewees 3 and 4 claim that any strategy to implement LTBP needs to be willingly accepted by the customer. Therefore, given the current uncertainty on which would be the customer reaction, it remains unclear whether a platform should be anonymous or not.

Interviewee 3 suggest to apply a not aggressive LTBP given the fact that we provide such service for free currently. The pricing in the airline industry RM began with little variation in prices but today we can see differences of more than ten times (Interviewee 1).

A factor that all interviewee consider relevant is the market situation. The current demand of the market is higher than the supply. In Infineon, it is called allocation or full allocation situation. In allocation situation, Infineon production throughput is at its maximum. All the production capacity is already allocated to customer orders. Therefore, if a customer order would enter the system, with an earlier lead time than contractually stated, it requires an extra effort from Infineon´s side to deliver. From the customer side, during allocation situation, the customer doesn´t have as much negotiating power as it can´t move to other suppliers because they are also in full allocation situation. Therefore, early delivery is valuable and monetizable in the current market situation.

**Perceived value**

An experienced marketer, interviewee 3, asserts that the right argumentation should be enough to explain to the customer the change from giving the service for free towards a paid

service. Interviewee 4 suggested that if we were going to apply LTBP, we should consider giving to the customer a better service and we should ensure that we can deliver the early orders in its wish date without a single day of margin. Both interviewees 2 and 4 coincide that if we charge for LTBP, the customer can get "*pickier*", meaning that the customer can also start demanding compensation in case Infineon is not able to deliver according to what is contractually agreed. Similarly, interviewee 11 ensures that customer will demand Infineon to apply LTBP even in situation where it is not feasible from Infineon side.

Alternatively to LTBP, interviewee 10 introduced to customers a project, for confidential reasons let´s call it "ZZ", which also helps customers to get their orders on the wish date. In this case, it is a service provided in the cases that customer necessitates of an earlier delivery and escalates it to the CLM managers at Infineon. In these situations, the customer is normally "desperate" and is willing to pay a considerable amount, sometimes it can be up to 100% of the original value of the order. In return, Infineon will do whatever it takes (if needed) to its supply chain in order to deliver by the wish date. Interviewee 10 assures that the results of this pilot project already proved to be successful. According to interviewee 10, the output is both customer satisfaction and profit gain for Infineon.

There is an argumentation contradiction regarding LTBP and the so called "ZZ" project. While both projects aim at helping the customer receiving earlier orders on the wish date, we see that the perceived value on the second case is higher than in the first case. It is not a matter of profitability or delivered value as customer accepts the "ZZ" project because it saves itselft immediately from a problem. The "ZZ" project is seen as customer-friendly project. Instead, LTBP is seen as a profit optimization tool for the supplier. Even though, both of them have the goal of increasing Infineon flexibility to deliver on customer wishes, perception is different. This argument is in line with the described perceived value barrier in section 5.2.

**Argumentation for customer acceptance**

The argumentation for introducing LTBP to the customer should be related to the value provided and especially the value perceived by the customer in order to gain customer acceptance. Interviewees 3 and 4 suggest that we need to provide a better service and the quantification for a better service depend on the extra charge that Infineon is willing to ask for. A

similar argumentation is taken by interviewee 1 and 2. They suggest that customer will not accept such change as we are already providing it for free.

According to the marketing expert, interviewee 3, there needs to be a change which explains the necessity for doing LTBP. This change can be full allocation situation combined with the willingness to increase the supply chain flexibility at Infineon for delivering earlier orders at the customer wish date. This is an increase on the value provided. The value increase comes from steering the demand rather than stressing Infineon supply chain. Moreover, Infineon should try to maximize the perceived value for the orders, reducing the activities that lead to a decrease of the perceived value by customers.

**Market segmentation**

The market segmentation can be pursued according to customer and product type. 8 interviewees refer to segmentation in order to detect a specific type of customer and product which the application of LTBP is relatively possible and easier to begin with.

Customer segmentation

Infineon customer can be currently classified within two categories: direct accounts and distributors. The direct accounts are those which generate the most revenue and they are given a direct access to Infineon businesses. In the distribution business, it is seen the customers who do not fulfil the minimum annual revenue to become direct accounts. Distributors and direct accounts have different needs but regarding to LTBP both groups should value the possibility of earlier deliveries.

The second segmentation stated during the interviews is to classify the clients according to the business unit. Infineon has four business units: ATV, PMM, IPC and DSS. On the one hand, this segmentation is especially necessary in Infineon given the fact that strategy is pursued according to each division (bottom-up). On the other side, some strategic decisions are taken top-down. Therefore, after having analyzed the suitability of LTBP in the market, it can be decided whether to make it a strategy along all divisions or only for certain divisions, certain products and/or customers.

From the interviews, we have identified a series of segmentation factors to consider for selecting the right customer. These factors are; strategic importance (interviewees 1, 3, 9), negotiation power (interviewees 4) and type of contract and flexibility (interviewees 7, 11). The strategic importance refers to those customers with whom Infineon has long-term relationships and development partnership. It is considered to have too much at stake to risk the relationship of these customer with LTBP. The second factor is the negotiation power. The negotiation power of the customer has correlation with the previous factor. The customers with negotiation power will likely demand such LTBP service for free given their condition of key customers. Therefore, these customers must be excluded from the project. Taking them into the project might reduce the flexibility to apply LTBP for other customers as they might demand to have early orders for free. The third customer segmentation factor is the type of contract and flexibility. At Infineon, there are several types of contracts with the different types of customers. These types of contracts are negotiated individually for every customer and we have described them below.

**Type of contracts**

The type of contract in place with customers depend on the customer and the sales channel (direct or indirect). Following, it is explained the main contracts seen at Infineon and the effect on the market segmentation for LTBP.

a) Basic supply agreement (BSA)

The BSA contract is the most basic and prevailing contract between Infineon and customer. It refers to the terms that the two parties agree on the business. It regards to the selling and purchasing of products. All customers have a BSA unless they are being negotiated or the customer has rejected to agree on a BSA. However, these cases are a minority as a BSA is normally advantageous for the customer. The BSA contract is a lifetime contract where any party can terminate it with an expiring period of six month. In practice, it rarely happens that a party terminates the contract and interviewee 7 refers that BSA is an expression of collaboration and trust. Regarding LTBP, interviewee 7 strongly recommends to bypass the modification of the BSA given the fact that it means that both parties would enter in negotiation period. Sometimes it takes up to 8 years of negotiation to reach an agreement (Interviewee 7). Therefore, he suggests to add a clause which enables application of LTBP without the need to renegotiate the whole BSA.

b) Volume purchase agreement (VPA)

The VPA agreement is a contract which stablished minimum and maximum supply for the customer and reserves the capacity for the customer. This type of contract also includes the minimum quantity per purchase and the price paid. The manufacturer is compensated in case the customer purchases below the annual minimum or above the annual maximum. Given the fact that this contract already specifies the price, introducing the LTBP should also be stated in the contract. VPA contracts are negotiated on a yearly basis usually and this is the time frame where Infineon could negotiate and introduce LTBP inside the contract.

c) Other contracts: Reduced Lead Time agreements, Order Auto-Acceptance and Fix Prices

This group of contracts represent a minority of the customers. These types of contract are obtained from customer due to their characteristics, i.e. negotiation power. The characteristics of this group of contract makes very difficult the application of LTBP. The reduced lead time agreements already give the customer the possibility to receive earlier than contractually stated lead time. Order auto-acceptance regards to the direct customers which have a special contract that makes the orders to be auto-accepted without the possibility to request them a price adder for an earlier and wished delivery. The fix price agreement is somewhat similar in the sense that price is totally fixed disregarding of the conditions of the specific orders. Therefore, LTBP is not possible to be applied to the customer possessing such contracts.

Regarding product segmentation, it depends on the type of products that could be available for Lead Time. Interviewee 3 asserts that any product which can be delivered earlier than contractually stated is eligible for LTBP, being the commoditized products the easiest to apply LTBP. A commoditized product is a standard product sold to large number of customers and therefore it has higher degree of flexibility. It is a small market within overall Infineon revenues and it could serve as initial segment, using a beachhead strategy which means to enter in smaller markets before going for bigger ones. Alternatively, other interviewees propose different segmentations. Interviewee 6 proposed to segment by the profit potential per product and

interviewee 10 suggests to segment based on the product allocation, applying LTBP for the products in full allocation situation.

### 6.2.2. Technology domain

This section describes how the implementation of LTBP will impact the technological domain. In this chapter, we begin discussing the integration of LTBP within the technical systems at Infineon. Following, we discuss about the order management system at Infineon and the technical requirements to implement LTBP.

**Integration vs No integration with Infineon systems**

Since the beginning of this research journey, the author of this research has had the practical objective to help defining the best alternative to implement LTBP. While there´s still plenty of work to do, this research shed lights into the different alternatives. Firstly, we discuss the differences between implementing LTBP in Infineon systems or beyond the systems.

To understand the feasibility to integrate LTBP in Infineon systems, it is necessary to look at how operationally business is done. At the beginning, Infineon and the customers reach a deal to create a BSA or similar to stablish the context of the business. Once this is in place, the customer will begin the placement of orders in Infineon systems according to the predefined agreement. The ordering procedure from a customer starts with the customer request for a price quotation. This means that customer provides details regarding the desired product and quantity to purchase. The second step is that Infineon will reply back to the customer with “an offer” which specifies the prices to be charged for the customer inquiry. Together with such offer, Infineon opens a channel where customer can order for a limited period of time. The third step is the placement of the order from the customer within the allowed time period in case the customer is interested. The following quotation requested by the same customer for the same product will automatically direct Infineon to the previous quotation and offer the same conditions.

The Infineon pricing operational process would be affected by LTBP. During the interview with the pricing experts, Interviewee 5 and 6, unveil the difficulty of adding LTBP in the current system. First issue is that Infineon provides a quotation price before the customer places the order

which is when it is defined the customer wish date and therefore it can be calculated the order lead time and compared to what is contractually stated. Second issue is that this quotation is an offer, meaning that the customer can still decide not to purchase the product given the price add of LTBP. The third issue is that Infineon would need to ask the customer to re-apply for a new quote with a higher price because after a quotation price is done, it can´t be modified from Infineon system. A fourth issue would theoretically appear after the application of LTBP and it is that when the Infineon system quotes a price, it looks for historical data and quotes the highest historical paid price. This means that without changing the current system, the price quotation would continuously increase as customer wants LTBP unless CLM re-assigns the price after each time the customer uses the LTBP option. These issues support the argument of Interviewee 5, "*our systems are not made for this*". Therefore, it can be concluded that LTBP can´t be applied within the Infineon systems at a pricing operational level without having to undertake major changes.

Following interviewee 5 and 6 rationale, the solution to this issue is to reach an agreement with every specific customer at a contractual level where it is stated the option of LTBP. In this solution, LTBP would be like placing a new quote in a different system where there is no connection between price quotation and LTBP.

Besides the order placement, LTBP also becomes relevant when there is an order change in the system. The following examples illustrates better this situation. Customer A placed an order on 1st January for product A, quantity A and wish date on 1st May. On 1st April, customer A wishes to add a quantity B to the current order for 1st May. Therefore, the lead time for quantity B is 1 month, from 1st April to 1st May, which is probably less than what it is contractually stated. Therefore, LTBP would apply. Interviewees 5 and 6 also discussed this situation concluding that LTBP presents pricing problems in the current systems, such as the third and fourth issue discussed above. With LTBP, there is the necessity to track changes in the open orders. The change tracking of the open orders was not something necessary in the past so an open order tracking tool needs to be created. Here, we call it the revenue-opportunity assessment tool (further explained below).

**Technical architecture**

In this section, we discuss about the technological needs for LTBP.

### LTBP Platform

The fact that LTBP is not embeddable in the current Infineon infrastructure increases the project difficulty for being accepted. This is supported by an argument made by the external consultant, interviewee 8. He claimed that the IT infrastructure readiness was questionable, reason which lead to rejection of LTBP during the NLoS&M initiative.

On the positive side, it also gives freedom to develop LTBP in many directions. During the interviews, it has been discussed the alternatives of LTBP in case it is not integrated within Infineon systems. Interviewee 1, 2, 3, 5, 6, 7 and 9 regards to a platform as the potentially best alternative to develop LTBP. Two main reasons support the design of LTBP as a platform. The first reason is that a platform can also support other developing project at Infineon. This makes third internal parties interested and willing to collaborate in the development leading to a win-win situation. Two potential win-win situations were identified during the interviews. The first need is an order management web interface for customer. The second is the creation of a sales platform where Infineon leverages the use of customer data.

Initial mock-ups for the order management web interface were created by the research author and they can be found in Appendix B.

### ERP system at Infineon

The software used for order management is also a central point for the implementation of LTBP. The order management software is the responsible to track changes in the orders and give information about the lead times (wish, delivery, confirmed…). Therefore, the order management software should be the responsible to understand whether an order is entitled to LTBP or not.

The ERP system, typical order management software tool for manufacturers, does not track changes on the open orders. Therefore, it is impossible to know what change is done by the customer and when it happened. Interviewee 1 asserts that it is common that companies cannot track such changes with the ERP system as it is too inflexible and generic to offer such option. Therefore, this means that there is a need to create a Revenue-Opportunity Assessment tool.

**Revenue-Opportunity Assessment tool**

The Revenue-Opportunity Assessment tool, interviewee 1 calls it Order Tracking tool, is a software that tracks any change on the current open orders. This tool is necessary to detect LTBP opportunities based on customer data. During the initial months of this research, the research author has improved the code necessary to track changes in the open orders, making the calculation possible and reliable. Appendix D shows in more detail the code for the tool development. According to interviewee 1, this tool will allow to assess the revenue opportunity at Infineon. This tool allows the analysis of customer order behavior. The tool it is expected to answer questions such as; “Which customers / products have a more volatile demand?”, “Which customers tend to ask for goods for periods earlier than contractual agreements”, “Which customers are more willingly to pay extra price for earlier delivery?”, etc.

In order to quantify potential revenue, it still needs to be developed the pricing scheme and undergo in a risk-analysis study to determine the expected profitability. In this risk-analysis, the practitioners ought to take into account potential downsides and revenue loss due to LTBP, for instance a planning error hindering the delivery on the customer wish date might have bigger penalization for LTBP order than normal order.

The following image shows the information which needs to be collected and analyzed on the open order tracking tool.

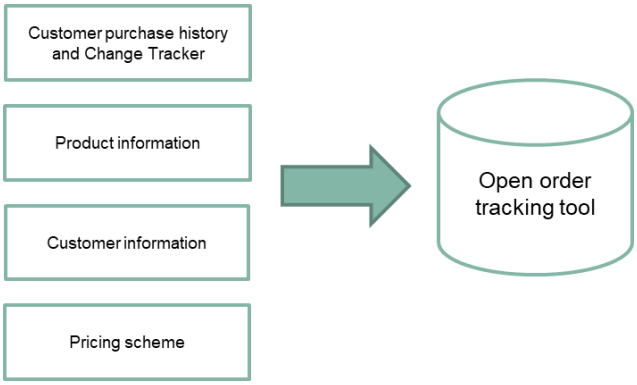



*Image 11: Open order tracking tool*

**Machine-readable database**

A machine-readable database tailored to LTBP necessities is also needed as interviewee 12 asserts that information is currently manually stored in different separated databases. Furthermore, Interviewee 1 asserts that the necessary information for LTBP is more detailed than what is stated in the contracts and therefore, it deserves a reinterpretation. The information in the database needs to access to the contractual agreements with customer, the open orders in real time, the contractual lead times and compare it with the planning and supply chain data (master data) to see whether the supplier can provide LTBP on the early orders. The following image specifies the information needed in this database.

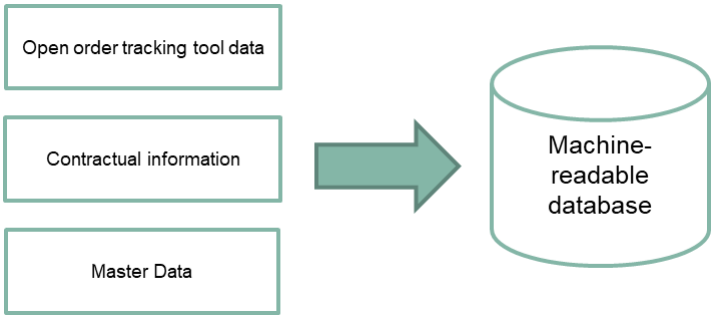



*Image 12: Machine-readable database*

**Planning system at Infineon**

From a supply chain perspective, the planning system also needs a major change. LTBP orders ought to be prioritize over other type of orders. Then, the planning system needs to also be optimized to allocate to LTBP the maximum flexibility. Currently, the allocation systems try to allocate the goods on a first come first serve basis and this need to change to prioritize LTBP orders. Even in this logic, the system has to be able to refuse giving out some goods expecting that a LTBP order will arrive soon. An example of the current logic is stated by interviewee 10:

"*We have a self-optimizing process. We have all the CWD, Customer Wish Date. If Customer A switches from week 3 to week 10, then this 10k of product A are not needed in week 3, then other customers who may have later dates will get the 10k. This is going to the free supply and the calculation runs again. The customers who had a bad commitment, they are now preferred for this 10k before delivery and they get it anyhow. We can't prevent it today because is the logic*."

From a production perspective, there also needs to be a change. The following quote from interviewee 9 explains the situation:

"*In production front-end and back-end, there would be a major change. Our system works as follows. An order is incoming and then you have a supply check in our order promising systems and everything is upon availability of the supply and this is the key here. And availability of the supply depends on the lead time, but the lead time is for not a steering parameter but a resulting parameter/metric based on the capacity, yield, demand, etc*."

An optimized systematic LTBP could be one where customer knows in the front-end, before placing the order, whether the goods could be delivered on the wish date with the specific price adder. Interviewee 12 refers to Amazon to explain such situation as Amazon normally provides the specific delivery date in advance. Having such feature in the system would involve changing the allocation of the stock and production orders. Currently, the planning software is doing the allocation activity overnight. Interviewee 12 asserts this is already outdated and that the best would be to plan the order immediately after every order is placed in the system, allowing the system to be updated at any time and making it possible to show the order delivery date in the front-end, as Amazon does.

Other quotes regarding the planning system changes can be found in Table C.14.

### 6.2.3. Organizational domain

In this section, we discuss the organizational impact for developing LTBP.

**Actors**

As of December 2018, LTBP is a developing idea within the Supply Chain Innovation department. LTBP development is in an early phase, in the middle of the design and test phase (Interviewee 1), the phase one in the BMI process.

A peculiarity of the innovation department is that budget is allocated to innovative ideas, such as LTBP. The innovation department supports promising ideas which wouldn´t be,

otherwise, developed in the business units. Therefore, LTBP doesn´t need management support from an early stage. However, at some point along the idea development, the project will need management support (Interviewee 12). It will need someone who takes the responsibility and that promotes the collaboration of employees from different departments working on this project. Therefore, as stated in barriers, it is critical to obtain management support. Below we make a list of the needed roles to implement LTBP:

- SC innovation
- Pricing
- IT
- Legal / Contracts
- Sales
- Marketing
- Supply Chain
- CLM

Also, LTBP will require to enhance the intercommunication between Infineon production and distribution sites in order to integrate the LTBP strategy at every point of the value chain at Infineon.

**Value activities**

Following, it can be seen the main necessary activities associated to the roles already mentioned. The description of the activities only covers the normal functioning of LTBP. The activities which cover the implementation of LTBP will be detailed in the next step of the BM roadmapping (step 3).

- SC innovation: The innovation team is not responsible for any task of the maintenance of LTBP
- Pricing: Pricing department ensures the pricing scheme of LTBP remains up to date and adapted to the business contextual environment.
- IT: IT department is responsible for the maintenance, upgrade and interoperability of the whole system.
- Sales & Marketing: In charge of communicating the existence of the platform and maximizing the potential customer using it.

- CLM: In charge of effectively communicating the contractual lead-time, maintaining the contractual information on the database and ensuring that customer pays the bill.

**Order Management strategy**

Pursuing a LTBP needs to be considered from the order management perspective. As mentioned in section 2.1.2, there are three strategies; MTO, ATO and MTS. Following a more stock-oriented strategy, such as Amazon, allows to increase delivery flexibility, reliability and increases the opportunity to apply LTBP. Therefore, once the company decides to pursue LTBP, it should be reconsidered the order management strategy. From a stock perspective, it is also useful to consider mixed strategies according to the production sold. For instance, for a commoditized product, Infineon could focus on MTS strategies, while for extremely customized product, the company should be more cautious to produce stock which will remain large periods of time in the warehouse.

Another consideration is that the application of LTBP would lead to have products for longer periods at the warehouse. The argument is that currently Infineon is serving customer as soon as possible and under LTBP, the planning system would stop allocating as “first come first serves”. Interviewee 9 quote reflect this situation:

“*I also think that in the situation all customer would agree on LTBP, then, this would increase the current flexibility but it would also decrease your flexibility to do other things, such as clearing out the inventory. Also, it would decrease the flexibility on our warehouse because we are waiting for the contractual lead time to ship our products and therefore, they would stay, on average, longer periods in our warehouses. Because, even though, you would like to ship it earlier, you have to stick to your value proposition and deliver on the contractual date.*”

Given the fact that Infineon is already having issues with its warehouse (interviewee 4), going for LTBP would require Infineon to increase its own warehouse capacity.

### Capacity allocation

A decision which ought to be taken is whether to allocate capacity for LTBP. This decision can, however, be taken in a more advanced stage with supportive data. This alternative, given by interviewee 1 and discussed with others is to create a smaller unit, with its own warehouse and production capacity which supports LTBP. The advantage is that the unit would operate individually from Infineon and acting as a distributor.

There are two major disadvantages for this option. First is that it needs to make sure that capacity remains used or it would translate into an economic loss. Secondly, such strategy is similar as creating a new distributor meaning that distributors could see such movement as an attempt to enter in the distribution market.

### Contractual order lead time

The application of LTBP will impact the already defined contractual lead time. In the current settings, Infineon reaches contractual agreement which specifies that the customer has to place the orders, at least, before the contractually agreed lead time. Interviewee 7 states the following:

"*In the contract it is very generic clause, usually. The default is that the customer has to place the order according to the applicable order lead time, this is the default wording. And, this lead time is under the Infineon sole discretion. We are communicating this lead time and changes to the lead time on a regular basis. This is basically the default wording we have in most of our contracts, we of course have exceptions*."

Both Infineon and customer are satisfied with this wording because both gain from it. From Infineon side, it avoids compensating to customer for longer than contractually stated lead time. From customer side, it avoids having to place all orders for longer lead times that what is contractually stated. With the applicability of LTBP, this needs to change as lead time will be the pricing variable, it needs to be clear at all time for the parties involved. Therefore, this means that there is a need to define how to communicate effectively such lead times. The following quote from interviewee 10 supports this need:

"*Regarding the lead-time, I think the definition of lead-time is a weak spot in the process about how Infineon communicates lead times. As far as I understand, we change it, we communicate the changes of the lead-time to CLM, and it is CLM who is in charge of communicating it to the customer. I don´t know how this is communicated from CLM to the customer. I have some feedback from a company in US and they were surprised so I am not sure how it works but we have a weak spot about how we communicate the lead-time. I don´t know if this should appear in the order book, if it does the customer should look it there but I know that customer don´t do that so, we have a weak spot.*"

### 6.2.4. Finance domain

This section discusses the financial and economical perspective for LTBP.

**Investment, costs and resource allocation**

A first decision that ought to be made is whether you outsource or not part of the work. Given the existence of the innovation department, Infineon uses the in-house resources to develop LTBP. Therefore, investments are not necessary at the beginning of the project.

The head of the innovation department is the champion of LTBP and he has sought funding to develop the idea. Under an EU funded project, called Safe-DEED (more info in the Appendix D), Infineon collaborate with few academic partners. LTBP development will be the output of this project from Infineon side and therefore, the financial resource allocation is covered under the EU project. Independently of the project funding allocation, Interviewee 2 asserts that the funding is correlated to the level of development of LTBP. Interviewee 8 suggest that the cost would approximate 50k€ basing on a basic study and that the project could be ready to be deployed in a period of 3 months with full support. However, the research author believes that both numerical values, in euros and time are too optimistic.

**Revenue, pricing and risk analysis**

The main argumentation to pursue LTBP is a theoretical profit optimization. Hence, the revenue potential is central in this project. The assessment of the revenue opportunity will

determine the feasibility and project support. As already mentioned, previous to the pricing categorization, it is needed to develop an IT tool that tracks the changes in the open orders. The research author contributed to the development of this tool and it can be found in Appendix B.

Although defining a pricing scheme for LTBP is central for this research, this research will not focus on it further as itself it represents already another research. Interviewee 5 and 6 stated that pricing ought to be done at an individual level and taking into account factors such as type of customer, quantity, cross-selling, lead-time and more. To add on top of the pricing model, a risk analysis is also needed in order to contemplate other economic and non-economic variables that would affect to the quantification of this project opportunity.

## 6.3. Translate BM changes into specific activities

The third stage of the BM roadmap is to transform the BM changes into activities. According to de Reuver et al. (2013), it needs to be decided where the resources will be allocated; in-house development, R&D projects, recruitment, partnering or outsourcing part of the activities. Following, de Reuver et al. (2013) asserts that the timeline, start and ending of the activities ought to be defined here.

The research identified a potential development for the BM roadmapping which is to combine it with the BMI process. Hereby, the research uses the BMI process in this step. This step will be separated into the phases of the conceptualized BMI process. For the elaboration of activities along the BMI process, the research follows McGrath (2010) and considers the necessity to begin with experimentation as early as possible in order to avoid unnecessary up-front invested resources. This means that in the first phase, the research proposes to undertake only the necessary activities which lead to the second phase. By pursuing only, the minimum required number of activities, it is expectable to find lack of management support. If this barrier appears, the researcher suggests to continue the development focusing on optional activities which can reduce the strength of the barriers presented. The research explains both necessary and optional activities below.

**Phase 1. Design and test**

The BMI of LTBP begins with the design and test phase. This phase is divided as design phase for the mental representation of LTBP and test phase for the activities which need to take place before experimentation phase.

Activities in the design phase:

- Industry assessment. General assessment of the industry suitability for RM. This assessment is stated in section 1.7.1.
- Company assessment. Assessment of the company suitability for RM and how it can be applied.
- Market segmentation assessment. Assessment of customer and product segments which LTBP could be applied. This activity should lead to discriminate between business units, customers or product types as the characteristics of the different groups should lead to differences in the potential of LTBP.
- Pricing Scheme. Development of the pricing scheme to apply for the experimentation. It could be a rather simple pricing formula as the objective from experimentation is to develop a more appropriate one.

Activities in the test phase:

- Development of the Revenue Assessment tool. In order to measure accurately the lead times and track the changes on the open orders.
- Selection of the specific customers and products under the market segmentation which will take part in the experimentation. The selection should target the products or customers which LTBP can be tested easily. For instance, the selection ought to choose a customer who usually asks for early deliveries and a product whose production flexibility is high enough to allow the manufacturer to satisfy the early delivery.
- The manufacturer ought to avoid delivering early deliveries for free. It has to “re-educate” the customer that free early delivery is not an option. Many of the case respondents suggested that the best action is to deliver on the contractual lead time

although the manufacturer has the goods. Then, when customer is used to receive the product on the contractual date instead of earlier, the CLM could contact them offering LTBP. Otherwise, customer might see unfair the fact of having to pay for a service which was free until now.

Alternative activities:

- Spread LTBP to other colleagues in order to gain support, especially the colleagues who can sponsor such project.
- Participate in innovation activities within the organization to sell the idea.
- Obtain customer insight which favors the implementation of LTBP. Gaining customer support would also be a potential alternative, however, the practitioner has to consider and deal with the possibility that customer feedback is negative and resistant.
- Pursue a risk analysis which proves that it would be feasible and economically positive to apply LTBP.
- Quantification of the required funding to ensure it is maintained within viable values.
- Find synergies with other developing projects in order to commonly develop the necessary systems while obtaining support from other colleagues.
- Create a common vision for LTBP in order to allow a precise communication about what is LTBP and what it is not. A common vision ensures argumentation consistency and proper communication within the organization.
- Quantify the gain on the supply chain flexibility with LTBP to prove the benefits backed with data.

**Phase 2. Experimentation**

During the experimentation phase, the activities consist of learning from the phase and understand the buyer´s behavior further. The experimentation process is itself fuzzy but the

objective is to collect data, learn from experimentation and adapt to the learning. The activities to pursue are described below:

- Involve customers to understand the fairness of LTBP.
- Develop an appropriate pricing scheme to understand how much the customer is willing to pay and avoid customer dissatisfaction.
- Learn how to sell LTBP to customers.
- Develop an efficient and accurate communication of Lead Times

In this phase, optional activities to pursue are the same as in the previous phase so they are not listed again.

**Phase 3. Implementation**

From a technological point of view, many activities ought to be done in the implementation phase in order to implement LTBP as a systematic process (no human intervention).

- Create a machine-readable database which can systematically interact with the order management system, the LTBP platform and the contractual information about the customer.
- Create the LTBP platform for customer to interact when ordering products.
- Modify the planning system to optimize the LTBP potential.
- Modify the order management system to provide the right lead times with LTBP.
- Integration of systems to make the process systematic, without the need of human intervention.

From an organizational view, LTBP changes the manufacturers' operational business. Therefore, the activities regard to inform employees about the change.

- CLM ought to be prepared for having to discuss the change customers.
- IT needs to ensure a correct and sustainable systems maintenance.

- Marketing department have the continuous task to ensure that the pricing scheme is adequate to the situation.

**Phase 4. Growth and incremental improvements**

The last phase refers to incremental improvement of the BM. According to Sosna et al. (2010) changes in the contextual conditions will challenge the established model. Therefore, this last phase is about a further improvement of the current model and extending it to other customers and products, involving communication internally with other business units and externally with customers. As learning takes place during experimentation phase and this is the last phase of the BMI process, the activities at this phase remain vague at this point of the writing. Therefore, the research will only assess the following generic activities: adapt the BM to the contextual situation, optimizing the opportunity of LTBP and extending LTBP to other products and customers.

The following images shows the exhaustive list of activities described in this section.

| Activities | Explanation | Owner (dept.) | Collaboration (dept.) |
|---|---|---|---|
| **Service domain** | | | |
| Progressively change the goods delivery towards the contractual lead time | IFX should stop providing the free service | Supply chain | |
| Customer data collection: Interviews, survey | Understand the customer reaction / Willigness to pay / Pricing potential | Innovation | Marketing & Sales |
| Platform argumentation | In order to convince customers | Innovation | Marketing & Sales |
| Promotion of the flexIFX platform | In order to convince customers | Marketing & Sales | Innovation |
| | | | |
| **Technology domain** | | | |
| Create a tool to track changes in the open orders | Track the changes in the open orders | Innovation | |
| Development of the revenue-assessment tool | Integrate the LTBP pricing scheme and the tracking tool | Innovation | |
| LTBP system integration assessment | Assess whether LTBP be applied with current systems | Innovation | |
| Quantify the flexibility gain with LTB | Simulation to quantify the flexibility gain in the production systems with LTBP | Innovation | |
| Platform development | Platform hosting LTBP for the customer | Innovation | IT / Marketing & Sales |
| Develop the machine-readable data | This databased compares lead times with contracts | CLM / IT | Innovation |
| Integration of the LTBP architecture | The different system interact with each other in a reliable manner | IT | |
| Modify the planning system | To optimise LTBP opportunities | Supply Chain / IT | |
| | | | |
| **Organizational domain** | | | |
| LTBP initial market evaluation | Understand whether the manufacturing industry classifies for LTBP | Innovation | |
| LTBP company evaluation | Understand that LTBP could be applied in the company | | |
| Creation of market segmentation | Develop internal market segments | Innovation | |
| Calculate Order Lead Times | Necessity to track order changes | Innovation | |
| Assess the profit opportunity with different segmentations | Assessment with the revenue assessment tool the opportunities for the different segmented markets | Innovation | Pricing |
| Develop a LTBP pricing scheme | Development of the LTBP algorithm for price add calculation | Innovation | Pricing |
| Contractual level modification | Assess whether the contractual agreement should or needs to be modified | CLM / Legal | |
| Increase the attention / Raise awareness of the LTBP opportunity | Find support within the organisation | Innovation | Anyone |
| Promote LTBP within different departments | Find support within the organisation | Innovation | |
| Defining a clear communication regarding Contractual Lead Time | To avoid miscommunication in the daily operations of the customer | CLM | Innovation |
| Creating a common vision | Generate a common understanding and goals for the project | Management | Innovation |
| Find synergies with other developing projects | To increase LTBP support | Innovatiom | |
| LTBP Trainings | Estblish the LTBP operational practice within the organization | Innovation | |
| Re-assess order management strategy | Decide whether to move towards more MTS for specific products | Supply Chain | |
| | | | |
| **Finance domain** | | | |
| Assessment of the revenue opportunity | | Innovation | |
| Development of a risk analysis | | Innovation | Pricing / Supply Chain |
| Quantification of the required funding | | Innovation | IT / Supply Chain / Marketing |

*Image 13: Image of the activities to implement LTBP*

## 6.4. Back-casting of ideal transition path

This section assesses the interdependency between activities and proposes a specific activity sequence to follow. Image 14 is a visualization of the explained roadmap and it shows the plan proposed to implement LTBP. This research recommends to follow the defined roadmap to implement LTBP.

**Phase 1. Design and test**

In the **design phase**, the research proposes to start assessing the service value of LTBP with a top-down approach. First, a general industry suitability is required (see section 1.7.1). After a positive assessment, the researcher should undergo on a general market segmentation (see section 6.2.1) in order to know the potential group of customers which LTBP could apply. From a positive market assessment, the research ought to look internally in the company, company mindset and IT systems to understand how to implement LTBP. The research suggests to firstly understand to what extend LTBP can be integrated with the established systems. Then, based on this analysis, the decision ought to be about building the IT landscape from scratch or modifying the current systems.

In the **test phase**, the practitioner needs to convince the management stakeholders before entering the experimentation. Therefore, the researcher needs to generate the data which proves that LTBP is interesting. The first activity is to calculate lead times with the revenue assessment tool (see section 6.2.2) and therefore, understand that the company has the potential to do LTBP. For calculating lead times, the company needs a software which tracks the changes in the open orders, this research calls it revenue assessment tool. The second activity is to analyze customer behavior and select the specific customers and products to do experimentation. Furthermore, at least an initial pricing scheme needs to be developed for the experiments. The combination of pricing scheme, customer and product selection and revenue assessment tool should indicate the potential of LTBP. The researcher proposes to undertake the previous three activities in the order mentioned as it first allows to generate the data necessary to be tested (first activity). With this data, the practitioner can select the specific products and companies for experimenting (second activity). Finally, the elaboration of an initial pricing scheme can be tested with the data

gathered in the first activity and the selected segmentation to provide theoretical values on BM profitability.

If management stakeholders are not supportive, alternative activities are presented in section 6.2.3. These activities are not sequentially organized as the practitioner should understand why management is not supportive and then pursue one of the described activities which directly affects the management decision. In case the management is not supportive at all, the researcher could, then, approach other product and customer segmentation whose ownership belong to other managers within the company.

Once management accepts to experiment, the company ought to avoid delivering the goods on the wished date in order to avoid the latter confrontation where customer claims that this service was done for free. In the meanwhile, the activity to pursue is to define how the usual business will work during the experimentation as there would be the need of manual effort from the employees who manage the logistics and orders of customers (CLM).

**Phase 2. Experimentation phase**

During this phase, the goal is to prove that LTBP is profitable. There is no defined activity sequence which is more appropriate. The activities in this phase are about learning from experimentation, developing an adequate price scheme, define the contractual lead time communication and adapt to the learnings.

**Phase 3. Implementation phase**

The implementation phase begins with the activities to institutionalize LTBP. As seen in the previous section, many activities ought to be pursued in order to develop a systematic LTBP. Technology speaking, the activities focus on developing LTBP systematically without manual required support. Initial activities to pursue in parallel are the creation of a machine-readable database, the creation of the LTBP sales platform and make the necessary modifications on the order management software (ERP). Once these three activities are complete, the three systems need to be tested and integrated. Once integration works properly, the activities move towards

optimizing the LTBP offering. To do so, the IT systems need to be modified, especially for the planning system.

From an organizational level, learning ought to take place. First, inform employees (see section 6.2.3 for the list of actors involved in LTBP) and generate a new vision about how to work and develop LTBP. From a service level, customer will probably ask and complain about the new way of doing daily business, especially if the goods are more expensive. Therefore, there needs to be an extra customer support with proper argumentation to avoid negative outcome, such as customers changing supplier.

**Phase 4. Growth and incremental improvements**

The sequence of activities in this phase remains vague as it is the last phase of the roadmap. Therefore, the roadmap will only show the activities described in step 3 (activity design).

The following image provides the BM roadmap visualization for LTBP implementation which was elaborated through the four steps described above. Optional activities have been placed between phase one and two and they should be pursued according to the contextual situation i.e. to undermine the barrier that presents the greatest opposition to LTBP development.

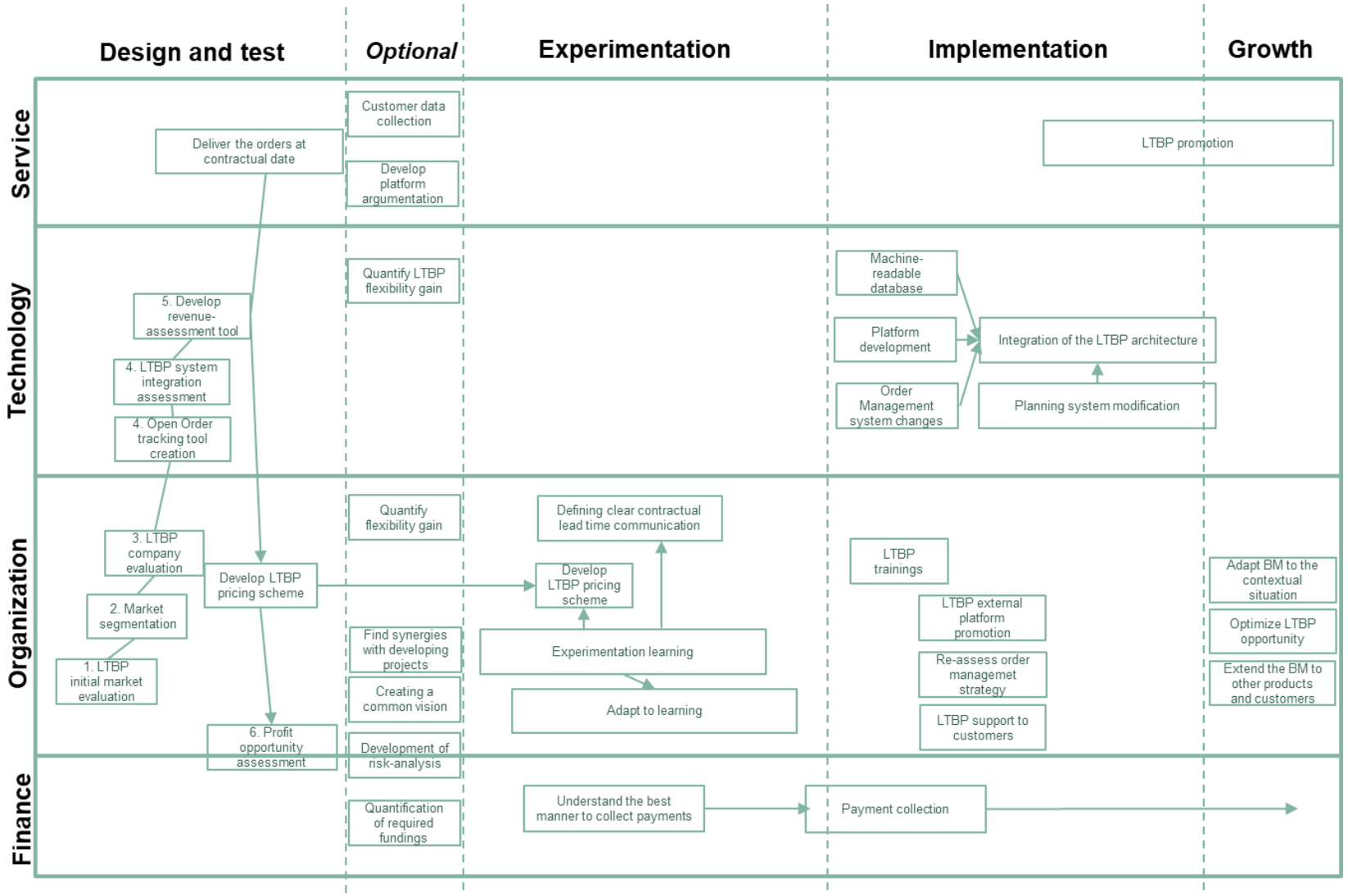



*Image 14: The LTBP implementation roadmap*

# 7. Conclusions and recommendations

This chapter concludes the research. It begins answering the research questions defined in Section 1.4. Subsequently, the research discusses the research limitations and future research followed by the scientific, managerial and personal reflections.

## 7.1. Summary of the research questions

The objective of the thesis has been to assess the suitability of BM roadmapping, in combination with BMI process, in order to overcome the BMI barriers identified for the LTBP implementation. From this objective, the research question was formulated as

*Which is the utility of combining BM roadmapping and BMI process to overcome barriers for the Lead Time Based Pricing implementation for manufacturers?*

To assess the method suitability, it was necessary to develop a rigorous and appropriate BM roadmap for LTBP, the research formulated a series of sub-research questions whose exploration was required to answer the main research question. The order of the sub-questions follows the thesis development. Following, an answer is provided for each of the research questions.

1. How can we conceptualize the BMI process in order to combine it with BM roadmapping?

This question was answered via literature review. The literature review in section 2.4 showed the different conceptualization streams of the BMI process. Supporting the research stream that considers BMI an organizational change process, the research supports considering BMI an on-going fuzzy learning process where it moves back and forth from the re-designing of the BM, re-experimenting under new conditions and re-implementing assets for the new BM. The research divides the BMI process into four phases. Phase one is the design and test phase which involves building the mental model and testing it internally in the company. Phase two refer to experimentation phase whose main objectives are to learn from customer experimentation and

adapt the learning with the necessary changes. Phase three refers to the implementation phase where the refined BM is scaled up and institutionalized. Phase four is the growth and incremental improvement phase where the BM adapts to the contextual factors affecting its development.

To understand why the BM roadmapping should be combined with the BMI process, the research suggest that the BMI process gives answer to *"When should we start or finish pursing each activity?"*, and the sequentially of activities requires less cognitive capacity. The theoretical framework, section 2.6 includes the combination of both concepts. Furthermore, the research proposes to combine both concepts for the third and fourth step of the BM roadmapping as the author pursued it in this research, see sections 6.3 and 6.4. After this research, the author hopes that academics who focus on BM roadmapping technique will similarly combine it with the BMI process as done in this research.

2. What are the barriers posed with BMI?

This question was answered via literature review on the topic of BMI barriers. An analysis of relevant papers for BMI was firstly pursued, see Table 1. After the allocation of a barrier, the research looked into adjacent researches to identify adjacent barriers. After having reviewed the barriers, it is seen that the term barrier is used interchangeable for describing the phenomena and the barrier which origin the phenomena, re-call from the example showed; the dominant logic and cognitive bias. Furthermore, barriers are context-dependent and present correlation between them. This means that for some cases barrier A implies B, vice versa or it has no correlation. The list with the identified BMI barriers is presented in Image 3.

A classification for the barriers was also sought with no results on the BM realm. Thus, the research concludes that there is not a common identified structure to classify BMI barriers and it used the STOF model, tool used in other sections of this research, to classify the barriers. The classification of barriers according to the STOF model is debatable as some barriers could be identified in more than one domain of the STOF model. Therefore, the research has aimed to find another classification. This classification is explained in the following sub-question as it was identified during the case study analysis.

3. What are the barriers posed with the implementation of LTBP?

In the previous sub question, it is explained about the context-dependency between barriers. Therefore, the research needs to adapt from the initial set of generic barriers to the specific case of LTBP. To do so, the research analyses the data collected from the interviews which the interviewees were asked to point out the barriers for the implementation of LTBP. Using ATLAS.ti 8.0, the author has codified and group the barriers with codes, considering adding a barrier when more than one respondent referred to it. The list of detected barriers can be seen in section 5.2.1. The codes for each barrier can be found in Appendix C.

Through the researcher own perception, the barriers correlation was pursued according to the characteristics which describe each of the barriers found from the data analysis leading to a causal map found in section 5.2.2. A key finding was to understand that each of the barriers can cause lack of management support. Therefore, the research classified the barriers according to its causality separating into level I and level II barriers. The second key finding was the correlation between few of the level II barriers. Following, there is an example of the correlation seen. The company mindset is associated to the cognitive bias of the industry as the industry knowledge has been gained from company mindset and vice versa. These barriers affect the value perception of the BM and the lock-in situation to avoid changing current practices and assets and it leads to maintain the first-mover uncertainty as establish business models remain unchallenged. The other level II barriers have no correlation but remain a potential cause for the lack of top management support barrier.

The highly correlation of barriers represents an added difficulty for designing activities that pursue them.

4. Which is the BM roadmap that facilitates the LTBP implementation?

The answer of this sub-research question was the development of the LTBP roadmap using the BM roadmapping tool. The researcher collected information from respondents about how to implement the LTBP (see interview protocol in section 3.1.2). The data was analyzed and the researcher pursued the BM roadmapping approach afterwards following its four steps. In step

one, a high-level LTBP BM was described (section 6.1). Step two focused on the impact of the new BM in the case study company (section 6.2). Step three was the elaboration of the necessary activities to implement LTBP. The activities listed in section 6.3. do not only focus on the developing needs for the BM to function properly but optional activities were suggested in order to overcome the barriers of LTBP implementation. In step three, activities were classified into the four phases of the BMI process. In step 4, the activities within each BMI phase were sequenced with the objective to provide a step-by-step roadmap aimed at optimizing the time spent in developing LTBP. Optional activities were distinguished, separated into an optional column, being on the practitioner choice the decision to pursue any of them. The constructed roadmap is seen in Image 14.

## 7.2. Answer to the main research question

This section gives answer to the main research question. It divides the answer in three main topics. Firstly, the research focus on assessing the utility of the traditional BM roadmapping approach. Following, we assess the impact of combining it with the BMI process and finally we assess the utility of considering BMI barriers within the described combination. This assessment leads to expose the utility of the whole approach used in this research which is the combination of BM roadmapping, BMI process and BMI barriers.

There are three topics to address from the process of creating the roadmap with BM roadmapping. First, the researcher identifies that the preciseness of defining activities and their sequence declines over time. The activity design and sequence are much clearer in an early phase but it becomes fuzzier as the new BM would be implemented. The explanation for this situation is the characteristics of the BMI which is uncertain and changeful based on the learning experience. This leads to the second approach limitation which is that BM roadmapping remains useful until the BMI experiences a major change. At this point, BM roadmapping should be re-assessed and modified accordingly. While the re-assessment shouldn’t take a considerable amount of time, the researcher recommends not to underestimate the time and cognitive requirement of BM roadmapping.

The third topic to address is the utility of using the traditional BM roadmapping approach. BM roadmapping does not only serve to plan. This means that the benefits of the BM roadmapping approach aren´t just the outcome of it which is about the activities, the activities´ sequentially and the plan visualized. The BM roadmapping process is a process of challenging your initial mental model, gathering data, involving external partners and finding the activities which need to be taken to implement the BM. During the development itself of the BM roadmapping, the author of this thesis experienced changes in the mental model from the new information which was collected from the interviews. Involving external colleagues in the process does not only bring the knowledge required to develop BM roadmapping but it is also a process where the researcher promotes the desired BM, challenges its own BM and has intellectual discussions about its development. In most of the interviews, the research author could infer whether the interviewee would be a supporter or a resistance for the desired BM. Therefore, the research suggests that pursuing BM roadmapping has great benefits beyond the BM roadmap constructed. Pursuing BM roadmapping allows the company to understand what to do next rather than being hesitant about it. A real example from this case is that one of the interviewees suggested specific top management who could be in a favorable position to support the BM, give resources and allow the experimentation to take place. This example supports the utility beyond the LTBP roadmap.

Regarding the combination of BMI process with the BM roadmapping, two topics aim to be discussed here. The first is that the conceptualization of the BMI should resemble the real BMI which is being dealt with. Many researchers have provided different conceptualizations for BMI which aims at describing the real BMI. In this case, it would be worth little to use a BMI process conceptualization which does not have relation to how start-up or incumbent firms pursue BMI.

The second conclusion regards to the utility of using the BMI process for BM roadmapping. The BMI process gives more structure to the roadmapping as it defines four general phases which any BMI needs to undergo. Having a more structured framework has advantages and disadvantages. In the favorable side, the researcher suggest that it eases the cognitive requirements to pursue BM roadmapping. The BMI structure defines four phases which provide help in defining the necessary activities needed in each phase. Therefore, it is also clearer whether a roadmap is incomplete as the activities designed do not provide enough action to move along the BMI process. The last advantage the researcher wants to address is that the BMI

process gives more flexibility to sequence activities. In the example of the LTBP roadmap, especially for later phases of the BMI process, the activities do not follow a sequence as a better activity sequence is not clear at the time of the roadmap creation. The structure in four phases allows the understanding of the roadmap sequence even if some activities are not interlinked. Having not used the BMI process, the activities wouldn´t have been grouped into phases and therefore, the researcher would have been required to decide an activity sequence even though it is not clear to do so. In the negative side, the fact of using a more structured approach might hinder the creativity on the roadmap design. Furthermore, the separation of activities in the BMI process might lead to, misguidedly, think that the real BMI process is linear while, usually, it is not the case. Overall, the researcher suggests that benefits outweighs the disadvantages.

Regarding the utility of combining BMI barriers with the BM roadmapping, one conclusion is to be addressed. When defining the BMI process within the roadmap, it can be deducted the significance of the lack of top management support barrier. The management support is crucial to sponsor the development and implementation of the roadmap which is the reason this research has classified it as Level I or critical barrier. This research has assessed the causes of this barrier and has classified them as Level I or supportive barriers. The activity design focusing on reducing these barriers is vital for the business model implementation success and, therefore, taking into account the presence of barriers, which tend to be generic i.e. cognitive bias, is crucial for the roadmap. The researcher suggests that a BM might have only one-opportunity shot to be accepted from management. Then, the awareness and assessment of BMI barriers might help the practitioner to understand when it is the right time to ask for management support.

For the abovementioned arguments, the research concludes that BM roadmapping is a useful tool which to begin the journey of BMI as it gives a clear view of the activities to undertake on the process. Considering BMI barriers is useful as not only activities which relate to the pure BM development ought to be taken care but also top management ought to be convinced and show support. Adding the BMI process in the roadmap, certainly, makes the approach more structure but the trade-off is positive. For this reason, this research proposes modifications of the BM roadmapping approach of de Reuver et al. (2013). This research proposes to combine BM roadmapping and BMI process into “BMI roadmapping process” to define the proposed approach undertaken in this research. The following image represents the steps of the BMI roadmapping

process proposed and pursued in this research in comparison to the BM roadmapping approach. This table shows the original steps proposed by de Reuver et al. (2013) on the left column and under the right column, it is seen the added steps to the original approach proposed in this research.

| | BM roadmapping | BMI roadmapping process |
|---|---|---|
| **Step 1** | Identify desired changes in the BM. | |
| **Step 2** | Analyze the impact of the desired BM changes on other BM domains | Understand which of the BMI barriers are applicable to the specific BM |
| **Step 3. a** | Translate BM changes into specific activities. | Translate BMI barriers into specific activities |
| **Step 3. b** | | Group activities into phases of the BMI process |
| **Step 4** | Back-casting of ideal transition path | |

*Table 5: The steps of the BMI roadmapping process*

## 7.3. Limitations of the research

There are limitations in each part of this research. First, in the literature of BMI. The BMI literature is growing and the topics covered in this research, BM roadmapping, BMI process and BMI barriers, are yet to be further developed. The limitation is that the current literature review is set as foundation for the research. For instance, previous researches on BMI barriers would have provided a more grounded, exhaustive and mutually exclusive list of barriers which would have probably led to design more activities to overcome barriers for the roadmap. The implication is that the research used the literature available and thus, it is restricted to its development.

A main limitation of this research regards to the research objective which is to assess the utility of the BMI roadmapping process. The limitation lies on the fact that the roadmap itself has not been yet implemented in the case study company. Therefore, the researcher has provided his own conclusions based on the data obtained previous to the implementation of LTBP. A longitudinal case study would have ensured definitively the roadmap utility as researcher would have been exposed to the whole implementation period. This remains as a follow-up for this study.

Regarding the approach employed, the BMI roadmapping process maintains the categorization under the STOF model domains as they were the most useful to describe the firsts

two steps of the BM roadmapping. However, for the STOF model a trade-off needs to be considered. The domains are not mutually exclusive from each other which leads to the limitation that one can found barriers and activities to belong to more than one domain. This hampers the facility to pursue BM roadmapping. For further research, it is suggested to understand what is the best BM ontology to combine with BMI process and BM roadmapping, one that improves or eases the task of BM roadmapping. This research claims that the best BM ontology has to be one whose domains are mutually exclusive to each other.

Another area with limitations is the case study. This study could only interview 12 different employees. Seniority and role diversity were sought. Out of the 12 interviewees, 10 have a senior position (+10-year experience) and they are from 7 different departments. In order to build a roadmap, it was preferred diversity of roles and departments in order to have a broader spectrum of opinions from the different departments. Then, the limitation is that the study ought to rely on the opinion of each of them in their relevant field of expertise. This means that the researcher position to identified bias was weaker. Having interviewed more experts would have led to obtain results based on greater amounts of data and it would have been easier to detect bias from respondents.

There were limitations with regards to the drawbacks of qualitative studies, explorative studies and purposive sampling. Sekeran & Bougie (2016) assert the difference of reliability and validity for qualitative research. Reliability is necessary but not sufficient for validity. For qualitative studies, reliability is measured as inter-observer reliability. For this study, only the researcher has analyzed the qualitative research and, therefore, a limitation is that the study did not cover an inter-observer reliability analysis. However, for achieving reliability, the researcher followed the described case protocol and data collection in section 3.1.

Validity refers to the extent that results represent the data accurately and they can be generalized (Sekaran & Bougie, 2016). Triangulation is a method used to achieve validity in qualitative research (Sekaran & Bougie, 2016). This study has first gain insight from barriers from literature review which have been later complemented with the interviews. For the roadmap, the interviews where complemented with regular meeting with the head of innovation, desk research about the case company and an in-house presentation. Therefore, the complementary activities

increased the validity of results. A limitation here, is that the research author did not record or took notes from the regular meetings with the head of innovation. This would have increased the validity of the model as the researcher would had proven to what extent expectations were fulfilled.

This research chose using semi-structured interviews for gathering data as it enabled the research to explore the case freely. On the one side, the option of asking spontaneous open questions allows to deepen the knowledge obtained. On the other hand, it restricts the comparability of results. The research believes that in this trade-off, benefits outweigh the limitation due to the already described objective of this research.

To finalize the limitation section, the research regards to the limitations of the practical work undertaken, the LTBP roadmap. The roadmap construction relates to the still young and simple BM roadmapping literature which the LTBP roadmap was built upon. This roadmap only considers the internal situation of the company. Then, the roadmap is limited to the list of activities and activities sequence, failing to explain and reflect the real BMI process. For instance, it remains uncertain to understand who to involve, when to involve other people and how to do it. Rather, the BM roadmap addresses only the what to do in terms of activities.

## 7.4. Outlook

This section discusses potential future research and the concepts whose further discussion would be beneficial.

Follow-up studies could be pursued from both field of BMI and RM. From the field of RM, this research takes into account the dynamic over time through the BMI. However, it is a plan for the implementation process. Therefore, the research suggests pursuing a longitudinal study on the implementation of any RM strategy in order to understand the dynamics of RM in the process of implementation. For instance, the case study company is still on the journey to find the optimal BM for LTBP and it needs to pursue experimentation to understand it. An opportunity of research would be to closely follow the LTBP process and evaluate its dynamics along the process in order to understand and assess the influence of BM roadmapping along the BMI process.

In addition, it would be interesting to understand the generalizability of the results with further research in different manufacturing industries and different RM strategies. The comparability of these two factors could lead to interesting results and could help practitioners understand the advantages and disadvantages of selecting each specific RM strategy. In this line of research, metrics should be discovered in order to assess the comparability of RM strategies and the circumstances which pursuing one or another strategy is more recommended.

From the field of BMI as organizational change, the already mentioned longitudinal study would serve as a case study to understand the BMI process in more detail. Another potential research follow-up is to understand how BMI changes over time and how it can be best visualized in the BM roadmapping approach. The current research combines these two concepts but has limitations as the combination of these two concepts was not the main goal for this research.

For BMI barriers, the possibilities for future research are broad. The research creates the first systematic classification on them based on BMI literature. Therefore, it would be interesting to follow-up and systematically analyze a specific field which have correlation to BMI, i.e. leadership, in order to find applicable barriers. The literature on adjacent fields is probably older than the BMI literature, so it would help to develop the knowledge in the BM field.

Another line of research is to understand how barriers change along the BMI as this research. This research *did its bit* by analyzing how LTBP barriers would appear during the different conceptualized phases of the BMI. However, the research needs to be further expanded to other researches and case studies before being able to detect and generalize common findings. Once the BMI barriers research is expanded, then, combining it with BM roadmapping could potentially follow-up this research providing deeper findings.

Finally, BMI research could be reflected on the BM roadmapping approach. This approach was firstly created by de Reuver et al. (2013) and, with the research development on BMI process, further combination with BM roadmapping could be tackled. This research assesses the utility of combining BM roadmapping and BMI process leading to positive assessment. The research combined a BMI process which would be suitable for incumbent firms. Follow-up research could assess other BMI conceptualization which resemble BMI in start-ups.

## 7.5. Reflections

### 7.5.1. Scientific reflection

The scientific reflection of this section is separated into, first, the BMI process roadmapping and, second, the LTBP roadmap developed.

This thesis has defined the term BMI roadmapping process which is a combination of the BMI roadmapping and BMI process to overcome BMI barriers. To assess its utility and provide a guidance, the research conducted a case study on the implementation of LTBP at a manufacturing firm.

The BMI roadmapping process follows the same basis as the BM roadmapping approach of de Reuver et al (2013). It is a tool which practitioners should consider using when it is desired to plan the BM implementation following a certain objective or KPI. For instance, the case study research focused on generating a roadmap with two objectives. The first one was to move as early as possible to the experimentation phase in order to avoid up-front costs. The second objective was to consider optional activities to overcome BMI barriers.

For the scientific research, the BMI roadmapping process sets further ground for research on BM roadmapping. It especially considers the BMI process and how it should change along the temporal dimension with the BMI. For future development, the temporal dimension of the BMI could be linked with the contextual or market situation. This could give answers to the best timing to initiate each phase of the BMI roadmapping process. Another important reflection is that the BMI roadmapping process does not take into account the external situation, such as competition, competition's BM, contextual factors, etc. This would certainly influence the BMI development. For instance, this research identified that the contextual situation of the case study company, which is full capacity allocation, opened the windows of opportunity to test LTBP. Therefore, considering the external situation proves useful for the consideration of the BM roadmap.

What the BMI roadmapping process is closer to give an answer compared to the BM roadmapping approach is to set when a phase should be pursued. For instance, in the LTBP roadmap, the experimentation phase should come after the activity of delivering on the contractual

date to the customers. And, given the characteristics of the BM itself, the LTBP BM should only be implemented when it is possible to be handled automatically i.e. at the end of the implementation phase. This extra information comes with the disadvantage of having a less flexible LTBP roadmap with more information, more structured and thus, more rigidity. This could hinder both generalizability of the roadmap to third parties and the extent to which the roadmap remains valid due to the on-going learning with BMI. To ensure that the roadmap is maintained updated, the researcher would suggest to add roadmap update as an activity along the predefined plan. For instance, the roadmap update activity could be place before finishing each phase of the BMI in order to ensure that the planning for the next phases are correct and there is no other activity left to pursue. This activity would generate a reflection on the past activities of the roadmap which could help for the planning of future activities.

Furthermore, this research elaborated on a BMI process conceptualization fitting it to the BMI experienced in incumbent firms. Therefore, the BMI roadmapping process remains suitable for large companies and one would need to assess its suitability for start-ups. To the researcher perception, start-ups might take less time in the design phase and more in the experimentation phase as they don't have an established base of customers in risk of losing. Instead, incumbents might dedicate lengthy amount of time in the design phase to ensure they are not risking customer relationship. Therefore, the defined BMI process conceptualization regards to incumbent firms and it remains as a follow-up study to understand how it differs for start-ups.

To finalize with the scientific reflection regarding BMI roadmapping process, the researcher wants to address, in a high-level, the utility of pursuing BMI roadmapping process in the process of implementation a new BM. This approach is especially useful to be undertaken when new BM are mentally designed. It helps building a stronger mental design and clarifies the main issues and critical points to consider during the implementation process. Involving colleagues is also extremely recommended as it strengthens the idea and starts involving other people. The BM innovator should expect to find supporters, people who see the value of the new BM and resistors, as well as it is its own duty to reflect on the potential cognitive bias which comes with the disruption of the current BM. Undertaking BMI roadmapping approach in one afternoon is not desirable as it produces an underdeveloped outcome with little benefits beyond the initial BM implementation assessment. The researcher suggests that from a well defined and developed

BM roadmap, the practitioner knows what to do next and who can be involved without hampering the new BM. Therefore, the researcher also suggests to undertake feedback-loops on the roadmap in order to adapt to the learnings and also communicate the learning to colleagues. This means that pursuing the BMI roadmapping process is not a one-time action but it should be continuously pursued along the implementation process of a BM.

The scientific reflection focuses, now, on the implementation of LTBP and LTBP roadmap for manufacturers. On one side, the extensive research on order management simulations had a mathematical character and it had not translated into seeing real implementation of RM in manufacturing industries. On the other side, the existence of the little empirical research focused on understanding the RM state-of-the art in manufacturing industries, leaving for further research the study of the dynamic process for implementing any RM strategy which is what this research focuses on with the creation of the LTBP roadmap.

In the field of RM, this research is the first to empirically explain how to implement LTBP and it does so with the generation of a roadmap. The research unveils the barriers hindering LTBP which means that future research should only focus on overcoming them to see real implementation of LTBP. It is identified a critical barrier which is the lack of top management support. These barriers are caused by the presence of the supportive barriers described in this research. The practitioner ought to undertake activities in order to undermine these barriers strength. Therefore, the researcher suggests to pursue the listed activities in the LTBP roadmap. A limitation to consider is the unveiled correlation between barriers. This might increase the difficulty of undermining the barriers one by one and the practitioner might not see the outcome of pursuing an activity designed to overcome a barriers as other barriers still stand.

The second limitation is that the LTBP roadmap possession without having developed it internally in the organization fails to provide benefits beyond merely knowing what activities one should do. As said previously, pursuing BM roadmapping provides the benefits to mentally challenge and improve the BM and involving other colleagues might prove even more beneficial than the roadmap itself. The researcher can imagine that providing the LTBP roadmap to another manufacturer would come with the answer of still being uncertain or unsure about what to do next.

Overall, the methodology developed with the case study at Infineon Technologies AG shows the potential of BMI roadmapping process as an organizational change process tool pursued in order to overcome BMI barriers and plan BM implementations. I hope that the BMI roadmapping process contributes to gain knowledge on the forward-looking literature for business model innovation. Further, I hope that the use of this research approach helps practitioners defining better quality BM roadmaps and it helps researchers to further understand and unravel the critical points within the process of business model innovation. In the RM field, I hope that the design of the LTBP serves to come one step closer of seeing real RM implementations in manufacturing firms.

### 7.5.2. Managerial and practical reflection

This section deals with managerial recommendation to practitioners who aim at implementing LTBP or pursuing BM roadmapping approaches. From a practical standpoint, this study has revolved on the implementation issues of RM and especially LTBP, leading to a roadmap creation for LTBP implementation using BM roadmapping approach. The managerial recommendations are classified as related to the LTBP roadmap, to the BM roadmapping approach and two other minor recommendations regarding the methodology developed in this research.

Beginning with the LTBP roadmap construction, this roadmap shows the plan to successfully implement LTBP. Therefore, it is recommended to follow this roadmap and given future major learnings, the research recommends to re-apply BM roadmapping in order to adapt the learning into the roadmap. Re-applying BM roadmapping shouldn't be a time-consuming task as the basis of the roadmap are already established. Another managerial recommendation is to build the LTPB vision around the LTPB roadmap. During the interviews, the researcher noted that employees tended to construct their own LTBP BM when LTBP was introduced. This led to a cognitive bias (one of the barriers found). Therefore, the roadmap visualization should serve employees to understand further the vision of LTBP and have a better position to proactively criticize, support and build on the created business model. Going back to the first recommendation, re-applying BM roadmapping becomes essential to maintain a common vision.

The realization of BM roadmapping leads to managerial recommendations beyond the construction of LTBP roadmap. It is well known that new BMs fail even before being tested. The BM roadmapping approach is useful to avoid such situation. This approach represents a useful tool to continue after the design of the BM, moving from design to test and implementation phase. It helps practitioners to take further actions and understand the feasibility of the new BM while, unconsciously, they are already doing activities to implement the new BM. One could say that the activity of pursuing BM roadmapping is the first activity of the defined roadmap. Then, the managerial recommendation is to embrace BM roadmapping as a technique to plan any new BM. The BM roadmapping provides a forward-looking BMI view where, at an organizational level, BM intrapreneurs can aim at disrupting the established BM in incumbent firms. Therefore, at Infineon, this approach is especially relevant for the Innovation department, as it represents the bulk of potential disruption of Infineon. An advantage and benefit for Infineon is that the BMI process conceptualization used, in this research, for BM roadmapping resembles the real innovation at Infineon (asserted by the head of innovation). Therefore, Infineon could follow the case used in this research where the researcher combines the BM roadmapping with the BMI process to give a clearer longitudinal dimension to the research.

Two other recommendations come from the method developed in this research. First, this research helped identifying the main barriers for LTBP implementation. Few identified organizational barriers, cognitive and structural, are not necessarily only present for LTBP. This means that any BMI, regardless of LTBP or RM, will present the common barriers found in literature chapter. Therefore, a managerial recommendation is to understand the generic barriers unveiled in this research and act upon them in order to reduce the strength of systematic barriers at an organizational level. This would lead to greater enterprise dynamism in changing and adapting to new BMI.

The second recommendation regards to follow-up on the interviews held at Infineon. Therefore, this recommendation is for the case studied company. The interviews led to spurred interests and, potentially word-of-mouth between employees. Few respondents showed direct interests to understand how LTBP evolves. Therefore, a continuous commitment to update respondents is suggested to be beneficial for the LTBP model. This continuous update might lead to the creation of a common vision, which might reduce barriers such as cognitive bias and

company mindset leading and, at the end, it might prove useful to build a base of LTBP proponents.

Last but not least, the researcher has provided the LTBP roadmap for the case study company. As the researcher stops its collaboration with the company, the last managerial recommendation is to make someone responsible for the roadmap in order to avoid forgetting about the project and the benefits of BM roadmapping.

### 7.5.3. Personal reflection

The thesis is an important step in the career of any master´s student. Having the opportunity of carrying out the study at a company such as Infineon Technologies AG was very beneficial for my personal and professional growth. It certainly makes the process of writing the thesis more demanding as you need to combine obligations from both sides but it is a truly rewarding experience which has allowed me to discover the exciting field of BMs and Revenue Management (Pricing). The opportunity of having discussed our LTBP business model with many senior managers is a reward which I take from this experience. After this experience, I am firmly convinced that, in one form or another, RM will play a role in every manufacturing industry. It is just a matter of time.

I would like to finish this master thesis with a quote of a visionary.

"*You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete*"

R. Buckminster Fuller

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# Appendix A. Interview transcripts

This annex is not available for the public version due to its confidentiality.

# Appendix B. Order Management web Interface

This annex is not available for the public version due to its confidentiality.

# Appendix C. Highlighted quotes from the transcripts

This annex is not available for the public version due to its confidentiality.

# Appendix D. Open Order tracking tool

This annex is not available for the public version due to its confidentiality.

# Appendix E. EU funded Safe DEED project

Description of Safe DEED project:

The Safe DEED project is an EU funded project that certain corporate and academic partners cooperate. The goal is to innovate with data-driven BMs. See below the abstract obtained from the requested proposal for funding:

*"As privacy and trust remain key in the data sharing debate, Privacy enhancing technologies (PET) will play a prominent role by 2025. Safe-DEED takes a highly interdisciplinary approach, bringing together partners from cryptography, data science, business innovation, and legal domain to focus on improving Security technologies, improving trust as well as on the diffusion of Privacy enhancing technologies to keep up pace with global macrotrends and the data economy, to enable the fastest possible growth. Furthermore, as it has been recently shown that even among large companies, many have no data valuation process in place, Safe-DEED provides a set of tools to facilitate the assessment of data value, thus incentivizing data owners to make use of the scalable cryptographic protocols developed in Safe-DEED to create value for their companies and their clients".*