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GAME THEORY SUPPORTING COMMERCIALIZATION PROCESS OF A START-UP COMPANY

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The aim of the thesis is to study the commercialization process of a start-up company and how game theory can support the decision making during the process. The purpose was to offer new insights to commercialization since the approaches of game theory have not examined in this context even the commercialization process is complex and needs strategic decision making. The reason for choosing this topic in the point of view of start-ups is that start-ups are in major role when creating innovations, but they often have lack of resources to bring the innovations to the market.

The research follows qualitative approach and the base of the research findings is from the interview. The interview was doing by using semi-structured interview questions. The entrepreneur was selected to interview because being involve with commercialization process of high technology product. The interview was doing in Finnish and recorded entirely. The transcribing was doing in Finnish and then translating in English by those parts which are used in the research findings.

Theoretical part of study consists two sections. The first section involves topics of start-up, innovation, commercialization process and challenges that the company might face during the process. The second section involves the approach of game theory and applications of it. After theoretical part there is describe the methodology of the study. This involve an analyze of the qualitative study, benefits of it. Methodology section presents the interpretations about validity and reliability of the study.

The research findings support the theory of commercialization process progressing. There is find few game theoretic approaches relating to different stages during the commercialization process. Most common models and approaches are negotiation situations, game matrix, cooperative games, and games of chance. The results support theory base but they are not generalizable. The purpose is to create a framework which start-up can utilize in some parts or entirely.

Conclusion chapter presents a customized framework which combines main activities find out from interview and strategic decision-making process. It also presents the importance of investors and other funding systems for start-up company. The last chapter discuss more about theoretical and managerial implications, limitations of the study and gives suggestion for the further studies.
1 INTRODUCTION

Innovations are important for companies because they offer profits, growth, and shareholder value even there are risks relating innovation process (Chakravorti). In this thesis the aim is to understand and examine the process of commercialization of product innovation. The purpose is also to study whether the game theory can support the strategic decision making during commercialization process. The idea of this study comes from research project which was going to commercialize new product. Game theoretic applications are extensively used in economics, social behavior, and mathematical approaches. Game theory deals with different situations on decision-making processes and involves strategic behavior. Even though commercialization also needs strategic decision-making, game theoretical approaches are not utilized to this sector. This leaves a clear gap in the research field which this thesis tries to fill in.

1.1 Research background

Successful commercialization of innovation requires strategic decision for company. Making this kind of strategic decision needs calculations, whether the company wants to commercialize innovation on their own or is it more effective to make cooperation with other companies for bringing innovation to the market (Haeussler. 2010.) Companies are not working alone but interaction with each other. Decisions what others are making, affect for how other parties are responding. Interest toward the commercialization process is grown since realizing that innovations are not boost economic growth unless they aren’t bringing to the markets through effective commercialization process (Kajanus et al. 2011.)

Knowledge is a key driver for economic growth and it requires investments in education, research and development and relationships between different actors. When innovations are commercialized successfully, knowledge achieve its full benefits and produce returns from investments. Thus, commercialization can be seen as important factor of economic growth. It also enables the availability of innovation to the end customers. (Natsheh et al.) The true benefit of innovation is realized through successful commercialization process. It is a complex process with multiple
challenges. Firm’s successful management to commercialize innovation can help to survive in dynamic business environment, dominate in current market field or develop new markets. Effective commercialization process provides growth of turnover, profits, and higher market share. Successful commercialization is thus strategically important to the firms. However, it is estimated that of every 3000 innovation ideas, only one is commercialized successfully. Thus, it is important that translating innovation ideas into products or services is managed well. Entrepreneurial activities around commercialization activities starts usually idea developing and transforming into product or service and continues to the launch. Globalization causes challenges for the companies and put pressure to create commercially success innovation (Datta et al. & Kajanus et al.)

Start-ups are innovation creators because they often start with idea based on new technology or product and bright vision of where they want to go. However, many of them fail because lack of capabilities and resources. Successful start-ups develop an innovation and compete by generating completely new benefits to the customers or by significantly improving existing benefits. Commercialization is a multi-stage process and requires range of resources (Paradkar et al.) Start-ups are requiring resources like money but they also generate high returns for investors when successfully commercialize their innovation. That is why there has been rapid growth in the number and diversity of institutions specialized in supporting the commercialization activities of start-up companies in recent years (Auerswald & Branscomb.)

Game theory offers solutions for any economic, political, or social situations when there are individuals who have different goals and preferences (Myerson). Interdependent decision making, and strategic behavior are the basic objects of game theory (Cabral.) Game theoretic approaches and models are widely used in different management situations. As Herbig describes in his article, game theoretic applications are utilized when studying behavior in different marketing situations: competitive behavior, negotiation and bargaining, innovation analysis, pricing, market strategy, promotion, market channels, product marketing, and market signaling.
According to these studies with different scholars, innovations are vital for companies and important for economical perspectives. Innovations cannot be utilized if they are not commercialized before. Start-ups are creators of innovations but there might be lack of resources and lack of knowledge when preparing the commercialization of new product innovation. Therefore, the study wanted to be limited to deal with innovation commercialization process in general, but the process is custom to more suitable for start-up company based on the interview. There is also discussed challenges relating to commercialization in start-ups. The Game theoretic approach was involved because it wasn’t examined before at this research field and because the researcher was interested in the subject.

1.2 Research questions

The aim of this thesis is examining and describing the interaction between game theory and commercialization. There is formed on one main research question based on the main purpose of the thesis. The main research question is:

- Can game theory support strategic decision-making during commercialization process in start-up company?

The aim of the main question is to examine different stages during commercialization process, what issues commercialization involves and how game theoretic approach can support this decision-making. The answer for the main question is built by examining the commercialization process, what challenges are relating in different phases of the process and how they affect decision-making at each phase. Based on that there is formed the set of three sub-questions:

- How commercialization process proceeds?
- What challenges the commercialization process includes in different stages?
- What strategic decisions are made in each stage?

The aim of the sub-questions is to support the main question and search framework to combine commercialization process and game theory.
1.3 Research method

This thesis follows the principles of qualitative study which is suitable research method when the field of study is new (Jamshed). The aim was to get in-depth understanding of the topic and qualitative research was seen as the best option. In the interview there was used semi-structured interview where the questions had been prepared beforehand so that the interviewee could answer as broadly as possible without limitations. Also, some additional questions were asked during the interview. The analysis was doing so that first the interview was transcribing word by word and then analyzing with using categorization. The research is made by using one case and interviewing one start-up company.

1.4 Definition of key concepts

Innovation born during multi-stage process which starts with the novel idea and ends with market introduction (Freeman & Engel). Innovation encompasses development and usage of the new product, process, or service. Innovation assumes novelty in the device or application or both. Innovation is iterative and complex process which is not moving forward linearly from scientific research to product development. Innovation process is trying to match market needs to technological capabilities (Innovation and Commercialization of Emerging Technology.). Innovation needs to be commercializing to gain full potential and adding customer value and bringing benefits to the firm.

Innovation commercialization process is making innovation available to be exploited profits which creates jobs and wealth. Commercialization is a process of different steps and different actions and the outcome is to bring innovation to the market (Jordan.) Innovation commercialization combines different activities which makes the process complex and create various of challenges (Datta et al).

Start-up is a firm designed to create new product or service under uncertainty (Moogk). Start-up companies are also called as a growth company and they are at early stage of their life. OECD and European Union have created measures which the firm have to achieve that it can call itself as a start-up. These measures are: at starting
point there can be 10 people at max, there has to be 20% growth during next three years, it can also define as a company who is creating its first product and will not make any profits yet (Ouluses. Referred 10.4.)

Game theory examines strategic decision making and strategic interaction. A game is the basic element of game theory. The purpose of the game is to describe situations of strategic behavior between set of players. Those situations are led by set of rules about who can do what and when. Payoff functions are measuring the gains for each player in certain situation of each possible combination of strategies. Payoff for each player depends player’s own action as well as the action of other player. Overall, game theory tries to figure out an optimal strategy for each player and finding that optimal strategy depends on what other player will choose hence strategic interaction between players. (Cabral, L. 49-50).

1.5 Structure of the thesis

This thesis includes six chapters. First chapter is introduction where the aim of the research is telling, and key concepts are measuring. This chapter also presents briefly used research method and explains research questions. Theoretical framework consists of commercialization and game theory which are explaining in chapters two and three. Chapter four is explaining the methodology of the study including validity and reliability for this research and explaining why there is using qualitative study. Chapter five includes the finds of the interview and interprets and describes the results of this research. Chapter six is conclusion which brings all together, answers the research questions. The last chapter discuss the theoretical and managerial implications of the study. The last chapter also includes limitations and develop ideas for the further studies.
2 INNOVATION COMMERCIALIZATION

This chapter presents basic issues of commercialization and concepts relating to it. In this chapter are also explain how the ideas evolves into innovation and what stages are included in innovation developing process. There are also explain, how innovation process can go in theory and what challenges there can be when commercialized innovation. Innovations in start-up context are also discussed.

Ability to transfer new technology into viable products, services and processes leads successful innovation which is sold in marketplace to gain benefits. Successful commercialization depends on many factors. Company has to finance new technology projects, hire skilled employees, protect innovation, utilize complementary technologies to make innovation valuable and gain market acceptance (Innovation and Commercialization of Emerging Technologies.) Commercialization starts from idea and product development and it will continue throughout the whole process from developing to launching innovation. To create successful and desirable product, all units of organization need to cooperate with each other and know true customer value. Commercialization activities aren’t just marketing responsibility, but it should implement interact with the whole organization. (Simula & al.) The concept of commercialization variates a lot between different scholars. Commercialization has been the last single phase of product launch but nowadays the concept is wider and as Aarikka-Stenroos et al. (2014) mention in their article, commercialization includes strategic and tactical planning, marketing activities, launch activities and cooperation between different stakeholders.

Product offers value to the customers. Commercially success product, is vital to the company. Product has to reach its goals and convince the customers about its benefits. After that it is commercially successful (Simula et al.) Goyal gives in his article an example of what can happen when product development is inefficient. Then the final product often doesn’t meet the customers’ needs, the product is positioned wrongly and the channel for the product is wrong. So, it is highly important that product development is organized well, and it cooperate with other units of the organization (Goyal.)
Every commercialization and innovation process are unique depending on circumstances and the organization who is bringing new product to the market because successful commercialization of innovation depends firm’s capabilities, human resources, the nature of top-management teams and the external environment within which the firm operates (Datta et al.) According, to Simula et. al. key concepts of commercialization are value thinking, brainstorming, productization, brand and the launch of new product. In the next paragraphs, there are presenting the definitions of the concepts.

For understanding value meaning to the customer is vital for successful company. Inside the context of commercialization, the company have to understand that activities of commercialization are in significant role for creating and communicating the total value to the customers. Brainstorming means forming idea of the new product within marketing, sales, and product development. Within these three activities, product development usually has biggest role since it is most concrete part but with marketing and sales, commercial capabilities can be increased (Simula et al.)

Productization and commercialization are often seen as a synonymous. According to Simula et. al. commercialization is however wider concept and productization belongs under that concept as an independent action which is necessary but not sufficient. Productization refers to transformation of physical good or intangible service or combination of these into a commercial product (Kankaanpää & Isomäki). Also, Simula et al. write that productization means a process where company define activities which are using for creating a product that is easy to buy for customers. It covers all decisions which are made to aim that product is properly defined, developed, produced, and delivered for meet customers’ expectations and achieving company’s goals. Stenius and Pouru add in their article that productization can offer competitive advantage and sales efficiency because it increases measurability. It makes forecasting and demand estimation easier and costs and deliverables are predictable.

Between scholars there isn’t just one definition when talking brand. Basically, brand is that image what people have from company. Brand is the promise of added value
and is more than the product offered. Launching new product is critical moment when new product is introducing to the market. Most decisive decisions are right timing in different markets and marketing communication tools which are used. (Simula et al.) Beard and Easingwood add in their article that new product launch is a critical phase in every new product development process.

2.1 Commercialization in start-ups

Start-up companies usually start their business with bright idea of what they want to do (Paradkar et al). They typically born around vision of the new service or product which solves customers’ compelling problem (Moogk). They usually have promising ideas, organizational agility, they are more willingness to take a risk comparing a bigger corporations and pursuit for rapid growth. The system of supporting institutions contains actors like angel investors and venture capitalists, start-up incubators, co-working spaces and government-funded support systems and they are ready to share their resources and knowledge to help start-ups when they commercialize innovations (Weiblen & Chesbrough.)

To gain benefits from innovation, it needs to transform in commercially profitable product. This requires knowledge and complementary assets. These complementary assets include manufacturing facilities, distribution networks and after-sales servicing. These are usually hard to achieve in early-stage start-up firms and which are caused three types of problems. Start-ups usually lack the financial resources which are needed to build capital-intensive complementary assets. Secondly, building complementary-assets usually takes time. Third, competitors may already have better equipment to build them than start-ups. This is why, the commercialization is often considered more challenging (Paradkar et al.)

The lack of resources for start-up may occur in many ways. Comparing to bigger and stable firm, start-up usually doesn’t have as much capital, they have fewer scientist and engineers, less legitimacy, fewer strategic alliances, evolving organizational structure and informal business processes. Start-ups struggle with liabilities of newness and smallness. This leads bigger failure rates. This offers competitive advantage to the bigger companies (Freeman & Engel.)
Existing firms usually know their customers and markets comparing to start-ups which are operating in environment under extremely uncertainty. Operating under uncertainty offers start-ups possibility to learn while validating their vision. Testing the early version of the product against relevant metrics offers best learning for start-ups. This can reveal whether the original idea is valid, and start-up can continue as they planned or not valid, which means that the strategy needs to change. For start-ups it is important that they validate their value and growth assumptions. While doing this, start-up can achieve the version of its product that is complete enough to indicate its value to the end-users and confirm the growth (Moogk.)

2.2 Innovation commercialization process

According to Tilastokeskus (Referred: 16.2.2018), one definition of product innovation is that it refers to a new or essentially enhance product or service which offers something new to the market. It differs from previous goods and services which are already existing in the markets for example through significant improvements in technical issues. Innovation is commercially successful product. Transforming idea into innovation and physical product is an activity in the beginning of the commercialization process. Product development and productization are thus necessary parts of commercialization (Simula et al.) Within company’s strategic decision-making is usually happen based on research findings of what have been done (Wilson).

For bringing high-technology innovation successfully to the market, it has to be clear for all units of the firm that technological knowledge must identify, obtain, combine, and manage. Innovation have to developed into a product and then manufactured, marketed and distributed (Natsheh et al.) Datta et al. based their theoretical framework of innovation commercialization process on 194 articles from 62 journals across disciplines of management, strategy, entrepreneurship, marketing and economics. This framework is utilized in this thesis when describing the innovation commercialization process. The framework compounds several entrepreneurial activities relating to innovation commercialization. The framework comprises three main activities: innovation discovery, development, and deployment. Under these activities there are six themes which consider when commercializing innovation.
This framework doesn’t mean that all processes are following this linearity. Depending on the situation, the process can start from deployment to test the product and collect feedback from customers and then continues to development and then again to the deployment (Datta et al.) Now the framework and concepts relating to it are presented more clearly.

![Diagram of Entrepreneurial Activities to Commercialize Innovations](image)

**Figure 2.1 Entrepreneurial steps to commercialization of innovations**

Discovery means recognizing the potential market for innovation. Development stage means for transforming innovation into products. Deployment stage deals with market entry and selling and distributing the products. After making these three main themes, Datta et al. recognize that it is not sufficient and there are some limitations to this categorization. They found many papers who focused the types of innovations. Some papers also linked innovation types with sources and development. Some articles include aspects like economic and technological feasibly relating to market entry. Some articles, innovation protection, also comes as a theme within the commercialization process linking this protection also in innovation sources and deployment. Based on these interpretations, Datta et al. categorized the literature
what they used in six themes: innovation source, innovation type, market entry (capabilities and feasibility), protection, development, and deployment (Datta et al.)

2.2.1 Innovation discovery

First theme under innovation discovery is the origin of innovation. It can progress within or outside the firm and the sources can be categorized as follows: organizational creativity, research and development, alliances and collaborations, innovation engines, technology clusters, and technology spillovers. Organizational creativity occurs when creative individuals and variety of social processes interact to maximize idea generation process to translate innovation into products with routines and incentives that firms have. Firm’s R&D knowledge has a positive correlation with sales and profitability. For R&D the key element is whether the innovation is internally funded or externally contracted. Alliances and collaborations help to recognize an opportunity of commercialization through different entities with knowledge sharing and transferring. Innovation engines means collaboration with universities and government. Technology clusters are linked together in geographically among buyers, suppliers and complement producers in certain industry. Technology spillover produce positive externality through R&D activities to share knowledge across organization and regional boundaries (Datta et al.)

According to Datta et al. innovation types are classified in the articles. Four distinct dimensions are: 1) product vs. process innovation, 2) radical vs incremental innovations, 3) architectural vs. component innovations, and 4) competence-enhancing vs. competence-destroying innovations. Product innovation means developing new product, making improvement in designing or performance of existing product or creating new feature of existing product (Baer, referred 28.3.2018). Process innovation includes activities that improve efficiency of production. Radical innovations are new and different than existing innovations. Architectural innovation changes the whole structure of the system or the way how components interact with each other. Innovation is modular when it doesn’t affect that much the overall configuration of the system. If innovation is built by using firm’s existing knowledge, it is competence-enhanced. As opposite, innovation is
destroying competence if it is not based on firm’s existing knowledge base (Datta et al.)

2.2.2 Innovation development

Second main activity stage is innovation development and it contains development and manufacturing innovation into commercial product. Based on the articles Datta et al. recognize two sub-themes relating to market-entry and protection of innovation under this stage. Market-entry also involves competence and capability of firm.

Market-entry consist of three themes which are entry-time assessment, first-mover advantage, and competency analysis. According to Datta et al. previous studies have proved that entry timing depends on advantage offered by innovation, the state of enabling technologies, the state of complements and customer expectations, threat of competitive entry, possible increasing returns, and firm’s resources. First-mover advantage is essence when thinking entry-timing. Advantages included to first-mover are brand loyalty and technological leadership, network externalities and bigger returns because learn-curve effect. Some disadvantages which might include for first-mover activity are high failure rates because significant costs relating to R&D, customer ambiguity, late movers can produce technology at lower costs and avoid mistakes of first-mover. All these enlarge the challenges of launching new products. Competency analyzing means that firm recognize abilities and performances that separate firm from other firms in the market field. These resources and competencies are knowledge which are difficult to imitate (Datta et al.)

One core thing when developing innovation is that it needs protection against duplication. Effectiveness of protection tells how quickly competitors can imitate the innovation. Patents, trademarks, and copyrights are three most used legal protection mechanisms. There is variation between industries from the effectiveness of protection. For example, software industries, patent only provide a small protection because competitors can operate around the patent without infringing upon it. However, diffusion brings benefits to the firm when it hasn’t enough resources to be only developer, producer, distributor, and marketer. Diffusion is also useful when
there is a threat that competitors may develop their own version of technology quickly (Datta et al.)

2.2.3 Deployment

Innovation deployment stage includes selling and distribution of the product to the markets. Activities under this stage are development and deployment. Development activities consist of designing and manufacturing and launch-pad. Deployment includes all practical activities like launching, distribution, pricing, and marketing which need to consider when make selling and distribution channels fluid which offers effectiveness to the commercialization process (Datta et al.)

In development stage firm has to decide whether it design and manufacture the product itself or collaboration with other firms. The process of developing innovation also has to make clear and the form of launch has to be decide. When making decision of manufacturing, things which affect to choose collaboration can be illustrate as follows: analyzing the resources of the firm and possible firm which to collaborate, the degree to firm can utilize the capabilities of another firm, the degree of importance when firm pays attention to control development process. Manufacturing the product inside the firm occurs when the firm has required resources to develop the product and when managers are worried about protecting their own knowledge and technologies and want to keep control through the whole process. Collaboration offers benefits like sharing risks and costs. Collaboration through networks it may be formed as strategic alliances, joint ventures, licensing, or outsourcing (Datta et al.)

According to Datta et al. previous studies are focused a lot about new product development process, during innovation development process. Three objectives are required to achieve successful product development process. These objectives are maximizing fit with customer requirements, minimizing time to entry, and controlling costs forming through development process. With parallel development-process and coordination between marketing, R&D, and manufacturing firm can meet customer requirements, entry-time, and cost controlling. Customer involving helps to achieve development projects with customers’ requirements and thus helps
to meet customers’ needs. Involving suppliers in product development helps reducing costs. Innovation can be put on the market in many ways. Spinout occurs when division of a company continues an independent business. Spinout usually starts in university transfer-officers and cooperate with business incubators. A subsidiary is an entity which is controlled by a separate entity. Two subsidiaries can also compete in the same market. A joint-venture is a partnership often requiring equity investment and the creation of separate entities (Datta et al.)

Last activity in the commercialization process is deployment and all activities relating to it. This stage is focusing launch timing, marketing, distribution, and pricing strategy. Launch timing is affected by issues like business cycle and possible seasonal fluctuations, production capacity availability and complementary goods in market. The decision of selling-out innovation or licensing it depends on various factors such as availability of assets required for launching. Two mostly used pricing tactics in literature which Datta et al. utilized are skimming and penetration. When skimming, the purpose is often to signal importance or quickly regain development costs with high price. When using penetration, the aim is to achieve high market share with low product price. Firm can sell product directly to the customers or use distributor. Technology and marketing have significant role when bringing new product to the market. Marketing decisions include costs, reaching customers, information content, and the ability to target wanted segments (Datta et al.)

2.3 Challenges in commercialization process

Research company, Value Clinic, did a survey which reveals that launch made by Finnish companies succeed more often. However, only half of those new launches achieve the goals set for them. According to survey one third of innovations leads to the launch and half of these reach the goals (Kauppalehti. 2012. Referred to 20.3.2018.) Failure rates are quite high and (Beard & Easingwood) recognize this same problem at worldwide; apart from the well-planned new product development strategy, the expected failure rate for new product in launch phase is 30. Launch is thus a critical phase at the end of the commercialization process. Managing activities during the commercialization process help to face different challenges during the process.
Successful commercialization process often requires a lot of knowledge and cooperation between many activities, resources, and external organizations. Business environments nowadays are competitive and dynamic and customer requirements are changing rapidly. Globalization, technological developments and changing customer needs are creating challenges which lead uncertainty. This means that rapid creation of new innovations and commercialization is vital to the companies and provides several benefits in different business fields. (Kajanus et al.) Firms need to manage the issue of dealing with uncertainty. Commercialization is often least managed and planned area in the innovation process even though Kajanus et al. recognize that commercialization helps to realize benefits of the innovation. The commercialization process is not simple and for succeed it requires that firm understand key factors which are affecting in certain context and with specific innovation. Challenges in commercialization process force companies to consider and rethink the activities and decisions required in certain innovation commercialization process (Aarikka-Stenroos & Lehtimäki.)

Natsheh et al. have recognize that for high technology innovation, it is important that commercialization process is market-oriented. Market-oriented means that the process starts with market, ends with market, and contain the market through the whole process. Kajanus et al. have recognized that there are four categories of main challenges faced during commercialization process of product innovation. Those categories are marketing, financing, networking and business environment. Natsheh et al. have listed very similar approach to the main challenges for saying that core difficulties during the commercialization process cause by marketing, resources, the business environment, and planning and managing commercialization activities. Aarikka-Stenroos & Lehtimäki, (2014) have categorized the main challenges under the three zones based on commercialization process activities to respond those challenges: strategic zone of commercialization, market creation and preparation zone and sales creation and development zone.

The first challenges are relating to the strategic field. Marketing strategy is the core of the strategic zone. It is also base of the whole commercialization process. Developing well-managed marketing strategy, firm can influence and guide marketing implementation for commercialization. While creating a useful marketing
strategy to respond the challenges, firms have to deal with the uncertainty on markets. (Aarikka-Stenroos & Lehtimäki, 2014.) Kajanus et al. bring forward that limited resources for marketing and financial activities may affect the facilities for commercialization. In addition, limited human resources may affect the ability to respond opportunities and threats coming external business environment. Structure of marketing strategy and processes is often informal in SME’s because of minor business knowledge or limited resources for marketing and management which may push them towards networking and external resources (Kajanus et al.) Firms may have difficulties to understand customer’s perspective which can lead to difficult of forming feasible marketing strategy (Aarikka-Stenroos & Lehtimäki, 2014).

The next challenges are relating to the market creation and preparation zone. This phase is vital since aim of these activities are to get customers interested in the innovation (Aarikka-Stenroos & Lehtimäki.) New technologies often face difficulties at the beginning of their life cycle since the technology is new and customers have to accept it (Natsheh et al). Often this area is belittled among the firms and investors. When override this section, the firm face major challenges in the sales creation and development phase. Innovation usually brings about that managers overestimate the attractiveness of novelty and its benefits. This is the critical point and they shouldn’t rush to market but make the preparation properly. It is important that the benefits of the innovation are communicate to the stakeholders. For small firms this area was more difficult because building credibility among customers and forming networks usually requires time and resources (Aarikka-Stenroon & Lehtimäki 2014.) One big problem also is, that firms are not aware of the official procedures relating for accessing resources like public finance. This usually takes more time than estimated and because of that, the firm might have problems to bring innovation to the market. (Kajanus et al. 2011.) Because of the challenge to get public finance like bank loans, start-up usually use private investors like business angels or venture capitalists (Fairchild).

The last zone involves challenges like creating and increasing sales. The most critical areas are mobilizing stakeholders and involving customers to the commercialization process. The purpose for every firm is to create sustainable revenue stream and figure out how to sell the product. Many start-ups get stuck at this point because
there isn’t a strategy to go to the market in scalable way. This may occur because there is not expertise around sales or the product is seen so good that it sells itself. Finding out a good way to market approach, separates firms who are going to be successful for those who won’t (Ashkenas & Finn.) This zone can only succeed well if two earlier zones are managed well. Preparing earlier zones well also gives ability to increase sales and growth. Small firms especially face challenges when they try to form networks and develop alliances with stakeholders (Aarikka-Stenroos & Lehtimäki, 2014).
3 GAME THEORY

Game theoretic approach helps to understand strategic interdependence. In business life we can assume that two firms (players) start a price war and compete against each other. The other choice for both is that they cooperate somehow with their strategic options. Each combination has different outcome of profit. (Begg & Ward.) Originally game theory has considered to be part of applied mathematics, but it is also an important research method of economics. It is the theory of strategic interaction and strategic decision making. Players with strategic interaction are affecting decisions of each other’s. Thus, strategic reasoning is a skill to put yourself in someone else’s position in order to find ways to forecast and affect the decisions of others. The purpose is to beat opponent for understanding that opponent wants to achieve the same goal. Strategic reasoning is also a skill to try match the possible choices even though parties are pursuing their own interests. Game theory assumes that players are rational. It is trying to formulate solutions for different competitive situations or cooperation situations between players and identify the best decisions for them (Hyytinen & Maliranta. & Kelly.) It is important that every player has more than one optional choice. If player only have one choice, then there is no possibility to choose a strategy or compare choices. Then the player cannot change or affect the outcome of the game (Kelly.)

3.1 Basic concepts of Game Theory

A game is simplified model that describe strategic behavior situations. In these situations, the payoffs for each player depends its own decisions but also the actions of another player. The optimal strategy for a player can be found when it thinks what other players will choose. Other players of the game act similarly. If the game continues over a numbers of time periods, then players have to consider that the choices of today may affect conjectures and decisions in the future (Cabral.) In economics, game theoretical approaches are trying to find solutions were both parties can benefit for reconciling the choices in an appropriate way even though the decisions are made independently (Hyytinen & Maliranta.)
3.1.1 Simultaneous choices of game

The game matrix is known as a normal form when representing games. This is also known as a strategic form of the game. Game matrix is usually simple form of illustrate the players and payoffs for each player in each combination (Hyytinen. & Maliranta.)

<table>
<thead>
<tr>
<th>Player 1</th>
<th>M</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>5,5</td>
<td>3,6</td>
</tr>
<tr>
<td>J</td>
<td>6,3</td>
<td>4,4</td>
</tr>
</tbody>
</table>

Figure 3.1 Game matrix

In figure 3.1 has represented two players and their payoffs. Player 1 has two possible strategies (N, J). Player 1 is a row player in this matrix. Player 2 also has two possible strategies to choose (M, H). Player 2 is column player in this matrix. In the cells, first number is the payoff for Player 1 and the second number is the payoff for Player 2.

In this game, one core thing is that both players are made their strategic solutions simultaneously. In real life there might be for example observation lag which means that it takes time for Player 2 to notice what Player 1 chooses and the other way around. It is thus possible that players make decisions at different time but when the decisions are made, neither of the players don’t know each other’s decisions. It is the same situation that the players were simultaneously choosing their strategies. (Cabral.)

When interpret the game matrix, one important question is relating to what strategies would we expect players to choose. In other words, what could happen in certain game. In the next, there are presented “Setting the price” game matrix (Hyytinen et al., 84) to illustrate the concepts of dominant strategy, dominated strategy and Nash equilibrium. There are two companies A and B. They both have two strategies. They can set a low price or high price. If they both set low price then they share the customers of the market. If one of them sets low price and another sets high price, then that company who sets low price gets all the customers (Hyytinen et al.) Figure
3.2 illustrates this situation and incomes for both companies in each possible strategy.

<table>
<thead>
<tr>
<th>Company A</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>15 000, 15 000</td>
<td>30 000, 0</td>
</tr>
<tr>
<td>High</td>
<td>0, 30 000</td>
<td>25 000, 25 000</td>
</tr>
</tbody>
</table>

Figure 3.2 Setting a price matrix

In this game the assume is that low price for product is 5€ and high price is 7€. It represents concurrent choices game. Manufacturing cost for product in both companies is 2€. In this game it is assumed that this cost is independent of the quantity produced and sold. In market there is 10 000 customers. The first numbers in the cells means the Company A’s payoffs and the second number illustrated Company B’s payoffs. If A choose the low price and B choose the high price, Company A gets all the customers and its payoff function can be described as follows: 

\[(5-2)*10 000€ = 30 000€. \]

This is also valid for Company B if it sets low price and A sets high price. If both set low price, then the function for both is \[0,5*(5-2)*10 000€ = 15 000€. \] If both sets high price then the function of profits is for both: \[0,5*(7-2)*10 000€ = 25 000€. \] (Hyytinen et al.)

Companies have to deal with strategic uncertainty since they don’t know what opponent is choosing. There are different methods to interpret different solutions for the game. These are called as solution concepts (Hyytinen et al.) When a player has a strategy, which is better than other strategies in that situation regardless of the other player’s strategy choices, this best strategy is called as a dominant strategy. The assume is that rational player always choose the best strategy (Cabral.) In “Price setting -game” above, setting a low price is dominant strategy for both players. This is because it offers bigger profits for both companies regardless of what other player will choose. For example, if Company A choose to set a low price, it will earn 15 000 if Company B also set a low price, (15 000 > 0). If B choose to set high price, then A will earn 30 000, (30 000 > 25 000). So, there is no way that should choose the high price in any circumstances. This same inference can be done with Company B (Hyytinen et al.)
The second solution concept is dominated strategy. These are actions which always lead worse strategy than some other strategy that player can choose. These dominated strategies can be eliminated because the knowledge that rational player is not choosing those options. This is because the purpose is to achieve the best possible situation for the player (Hyytinen et al.) In “Price setting game” dominated strategy for both players is to choose high price. It always brings lower profits for the company than setting a low price. Cabral recognize that there can be assume that rational player is not choosing the high price and if both players are rational then neither of them is not choosing the high price so they both choose the low price. When analyzing the game there are assumption that the players are rational. This also involves the players’ belief about each other’s rationality (Cabral.)

A pair of strategies form a Nash equilibrium if there are no incentives for players diverge its strategy without that opponent also change its strategy (Cabral). One important point relating to Nash equilibrium is that each company considers what its competitors can do before deciding on its own strategy (Begg & Ward). As a solution concept, the aim is to find the choices which are best responses to each other. Best responses give the best solution for a player regardless of what other is choosing. If these best responses are finding for both players, then neither of them has no incentives to diverge the choice. In Price setting -game, choosing a low price brings higher profits for Company A if B also choose the low price. This is thus best response for A to that B sets low price. Choosing low price also brings bigger profits to Company B if A also choose low price. Thus, choosing low price is the best response for Company B if A choose low price. Both are choosing their strategy’s without knowing what other is choosing. The assume of rational players leads that other is choosing low price. Neither of the players are worth to unilaterally deviate from this strategy because it is not leading improves of the payoff. This is the Nash equilibrium for the game (Hyytinen et al.)
3.1.2 Sequential games

The best way to illustrate games with sequential choices is to use a game tree. It is a decision tree involving more than one player. This game tree model is also known as extensive form of the games (Cabral.) Game tree points out the order in which the choices are made (Hyytinen et al.). Next there will be presenting an example of extensive form of game in the situation whether the company should entry the market or not (Hyytinen & Maliranta, 87).

![Game Tree Example]

Company B is already in the industry and only actor there. Company A makes the first decision, is it coming in the industry or not. If it decides not to come, then there is no interaction and the game ends. If it decides to come in the industry, then the choice moves to Company B. Company B then decides if it set high or low price. Then is again Company A’s turn to choose whether it will be set low or high price. It is common that these games are solving as backward induction (Cabral.)

Solution concepts in extensive games are usually apply the idea of sequential rationality. This means that players are looking forward but rationalize the possible choices by looking game tree in reverse order to find out, what decisions makes sense if the game continues to that point of tree. This method is called backward induction and helps to eliminate those branches of tree which are newer chosen. An example of “Entry” -game tree can be solved in reverse order. The last choice – the
price decision of Company A – is first. Strategic reasoning starts here when Company A thinks if they set low or high price when realizing that Company B has been set low price. The best response to that for A is set low price too. Second to last choice is Company B deciding if they set low or high price. Company B is also rational player and looks forward, so it understands the strategic reasoning what A is going to do in next phase. The choice which leads the best possible solution for Company B is to set low price. The first choice is coming last in this backward induction. If there is not any costs for coming to industry then rational player (Company A) will make the decision to come in the industry (Hyytinen et al.)

3.2 Game Theoretic models in marketing discipline

Since 1944 when game theory was formalized by Von Neumann and Morgenstern, its applications in marketing field have recognized especially competitive behavior and negotiation situations (Herbig). Most of the traditional marketing models are often based on optimization and are also asymmetric. Traditional marketing models are focusing the individual decision-makers while game-theoretic models are interactive and trying to find optimal solution between several players. (Chatterjee & Lilien).

The role of game theory in marketing disciplines is unclear and there are scholars who see the game theory in one potential approach in marketing research field but also scholars who criticize it. The criticism toward game theory usually relates the rationality of game theory because in markets it is not always the best price which is chosen. Often there is situations where the actor is irrational, and the choice is based motives like relationships. Critics think that game theoretic models suit best for the situations of perfect information. Since most of the firms know more about their own capabilities than competitors’, the situation of incomplete information is normal in business life. In many game theoretical consequences, the best decision is often probabilistic choice. Game theory models highlight competitiveness instead of cooperation. Reputation of the firm affects its strategy. Formal game theoretic models do not take this into account (Herbig.)
Between the marketing scholars there is also positive opinions toward game theory and it is used in marketing applications. Bargaining situations and outcome of it depends expectations and reputation of active players. Also, buyer-seller negotiation situations are utilized game theoretic models. Interaction is key element in sales relationship because cooperation is happening for mutual benefit. Game theory is a useful tool when analyzing oligopolistic markets. It is also utilized in the innovation action. Relating to innovations game theory is utilized when studying whether a company should or shouldn’t share the information of trade to competitors. There is also studied the patents and find out that innovative leaders invest in patents more than followers. Pricing, market strategy, advertising, market channels, product marketing, and market signaling are also examined through game theory (Herbig.)

3.3 Game Theoretic applications

Games can be divide into three categories. These categories are games of skill, games of chance, and games of strategy. In games of skill there is only one player who knows all the outcomes. These games are suitable for many management situations. Because the interdependence is missing, these games should not categorize as games. Games of chance are the games where the opposite is nature. These are also single player games. The player doesn’t control completely the situation because outcomes depend partly on player’s decision and partly on nature and thus certain outcomes aren’t coming inexorably. Games of strategy includes two or more players, but nature is not one of them. These games involve uncertainty because players don’t know what others are choosing. Games with strategy can be divided as cooperative, non-cooperative, mixed-motive, and zero-sum games (Kelly.)

Cooperative games are games without conflict. Both players are seeking mutual benefits. In purely cooperative game the players have to agree on their order of possible preferences of possible outcomes, so they have incentive to cooperate for achieving an equilibrium which they both gain benefits. Minimal social situation game is cooperative game which involves imperfect information. In this situation players know only, what decisions may be made. Zero-sum games are games without cooperation and preferences are completely opposite. This means that what is good for another player is bad for other player. Game theory suits best for the situation of
zero-sum game. The mixed-motive games are between cooperation games and zero-sum games. Mixed-motive game is not producing pure solution because pay-offs vary from strategy to strategy. These games are used when interpreting real-life situations. These three categorize involves two-player game field. Non-cooperative games are multi-personal games. These games solution is based its equilibrium points. The outcome is not giving the players cause for regret when the decisions of other players are revealed (Kelly.)

Game-theoretic approach to negotiation theory is also known as strategic form of this theory. Bargaining problem was first presented as a set of individual rational Pareto optimal agreements. Strategic negotiation theory involves time-strategic, institutional, informational and commitment aspects. This theory focuses equilibrium and efficiency. There are two different solving methods for bargaining problem. One is axiomatic and one strategic. Axiomatic approach is macro-oriented and is called cooperative theory because the actors can make binding agreements with each other. The strategic approach focusses on actors’ choices of strategies in non-cooperative game situations (Hausken.) In different bargaining situations the bargainers are players of the game. The players either react an agreement or fail to react agreement and each bargainer has a preference ordering. An agreement can be price or detailed contract. The players’ attitude toward risk plays a major role. Uncertainty about other player’s behavior is typical in bargaining situations. The basic structure of bargaining situation can be described as a game tree form. The players are making decisions only in certain time. In each period, \( t \in T \), one of the players proposes an agreement and the other player accepts the offer (Y) or rejects (N) it. This will be described as an extensive form of game below (Osborne & Rubinstein.)
In Figure 3.4 Player 1 proposes an agreement for Player 2. If Player 2 accepts the offer, then the game ends and agreement is implemented. If the agreement is rejected, then the play passes to period $t+1$. In this period Player 2 proposes an agreement which Player 1 is accepting or rejecting. The game continues as long as the agreement is rejected and moves the next period where player who reject the agreement makes new agreement (Osborne & Rubinstein.)
4 METHODOLOGY

In this chapter will be presented methods and methodology which is used in this research. First there will be discussed practical and empirical implications of the research methods. This includes explaining the data collection method and analyzing method for the data which collected. At the end there will be evaluation of validity and reliability of this research.

Next there will be presented shortly the meaning of research and some philosophical aspects. Research is systematic and methodological process which increases knowledge. It is about answering questions and developing knowledge and new information. Making a research is a process which needs a research strategy including an approach of research method and approach of research philosophy. Research methods are divided into inductive and deductive approach. Inductive theory-building process starts with observations with the aim of generalize the phenomenon. Deductive approach starts with well-known theory and building hypothesis which is tested during the research. Deductive approach usually follows quantitative research and inductive approach follows qualitative methods. Research philosophies are divided into epistemology, positivism, interpretivism, ontology and axiology. Epistemology deals with the questions about nature, acceptance, and formation of the knowledge. Positivist approach means that the research is objective, and researcher follow minimal interaction with research participants. Interpretivist approach supports the view that the researcher interacts with the research participants. Ontology however concerned with the nature of reality. It handled more about how we think the world is. Axiology follows ethical issues relating the nature of value. These are important to understand because they make the research clearer to the reader (Wilson, J. 2010.)

The purpose of the thesis was to examine commercialization process in start-up company and study if game theory can support the strategic decisions making during process. This research follows qualitative strategy. Commercialization process is created by people and within social context. In ontological way people are major part of the process so perceptions and actions of participants create social phenomena. Subjectivism also relates that because the aim of this research was to study the
motivation, social interactions and attitudes which leads people acting in particular way during the commercialization process and form certain strategic decision. Epistemological way as a researcher I believe that knowledge is based on experiences. In commercialization process people are interacting with each other and all of them are forming their own “truth” based on the knowledge and experience they have in certain thing. As Schwandt write in his article, interpretivism holds that human actions are purposive. This is associated in context of commercialization process because in each member of the process have own purposes and those purposes are driven them act in certain way. As an interpretivism way I truly take part of the research and the aim of the research was to try find some new insights into context.

4.1 Qualitative study

Qualitative study uses naturalistic approach and try to understand phenomena in context-specific settings (Golafshani). The aim of this research was to understand this complex commercialization process and examine if game theory can support the process. The research is theory driven since the relevant theory is first explain properly and research questions are formed. Like Wilson (2010) has write in deductive approach the theory and hypothesis built on it come first and affect the rest of the research process.

Analytical and critical thinking skills of researcher are core issues when analyzing the data in qualitative studies (Dudovskiy). While the aim was to study the process, which depends on the people and their actions, semi-structured interview was looking for the most propriate way to collect data. Semi-structure interview which are also known as theme interview leaves more freedom to the researcher. In this method the questions are made before the interview, but they are not that accurately defined so the interviewee can answer in his own words. The answers are not prepared as structured survey research so there was conversation between the interviewer and the interviewee (Koskinen et al.) The questions were prepared based on the theory so that is why this research is more theory-driven and deductive instead of inductive approach which is normal on qualitative study (Wilson, 2010). By doing this, it is possible to collect versatile material for the basis of the analysis.
4.2 Data collection, analysis, and interpretation of data

Theme interviews are simple form of communication between researcher and interviewee. This interaction usually consists the questions of researcher and a story-telling answers by interviewee (Koistinen et al.) The data was collected by interviewing an entrepreneur who is involving commercialization process of high technology product development by start-up company. The company is launched 2017. The interview was recorded entirely, and it takes one hour and 15 minutes. The analysis part starts with transcribing the interview word-by-word. The interview was doing in Finnish, so the transcribing was also doing first in Finnish and finally translating the citations used in the result part in English. The next phase was to get familiarize with the data. The data was readied through few times and categorized different themes with different colors and then searching most relevant issues relating to the theoretical framework. In interpretation phase the purpose was to find supportive things relating to theory, important issues for start-up company and reflect the answers towards the theory. The results are presented using different methods like descriptive text, citations from the interview and models.

4.3 Validity and reliability

One core thing in any research is to systematically examine the quality of the research. Reliability is a concept which is often used for testing quantitative research. By adopting this concept to qualitative study, the aim is to evaluate the quality of qualitative research (Golafshani.) Reliability means that research can provide steady and consistent results. Reliability deals the issue of repeatability of the research. Being reliable the research also needs to be valid. Threats involves in reliability are time error, subject error, and observer influence (Wilson, 2010.) One important issue coming up during the data analyzing was uncertainty of the answers during the interview. Inexperience of the interviewer may lead the situations whether the questions were properly presented and understood correctly. Another thing relating this is that because of the complexity of the commercialization process it was hard follow the specific order. Sometimes it was unclear what stage we were talking about. Linearity of the interview could have been better. For improving this, there should have focused more on creation of the question framework and asking more
specific questions. Also, the commercialization process depends on the company so with these questions the answers may not be similar in different situations.

Validity deals with the relationship between construct and its indicators. It refers how well the used research methods determinants are measuring what they are supposed to measure. This is the internal validity of the research. External validity is the scope to which the findings from the research can be generalized to other cases. When improving the validity, it is important to consider that your research questions and objectives are clearly defined, understood and workable (Wilson, 2010.) Validity is usually relating more quantitative strategy since the results are easier to repeat and generalize because structured question framework. Using qualitative method, the aim was to find deep understand for certain phenomenon, but the purpose wasn’t generalize the answers but create knowledge and framework which every start-up company can utilize the way which suits for them. Transparency improves validity of the research. In this research the interview question framework is presented in the appendix and also the questions are interpreted more specific in research results chapter. The interview was made in Finnish and the sentences which are used are translated into English. However, the original Finnish sentences used in this study are presented in the appendix part.
5 RESEARCH FINDINGS

In this chapter, the results based on the interview are presented relating to research questions and theory. The results are presented by categorizing them in three themes. Themes are followed the framework from Datta et al. about three main entrepreneurial activities to commercialize innovations: discovery, development, and deployment. Each theme is also specified in some interview questions which are most relevant to that stage. Each theme is going through like that the commercialization process in each stage is illustrated relating to interview for purpose to describe each stage and strategic decisions which firm might face. Challenges in each stage are also present. Game theoretic approaches are included to that by illustrating what kind of situations firm face in certain phase and what kind of solution they might come after strategic decision-making.

5.1 Innovation discovery

Innovation discovery deals with the decisions relating to market recognition for innovation and themes like innovation source and innovation type. At this stage the questions coming up are involving the things like which innovation source suits best and support firm’s strategy and what benefits or disadvantages it might cause to strategy. Based on the interview next will be presented most relevant findings. The strategic decision making is going to analyze in some parts with game theoretic approach and can it help the firm to compare different decisions.

Innovation commercialization process starts with discovery and idea perceiving. Idea perceiving might take few years before it is at that point that the firm can more think other commercialization activities and how to continue. This company’s innovation is product innovation.

“Typically, this kind of things, takes a long time because this is quite technical and reasonably demanding thing to do. So, it can easily take for years when you start practically from zero to develop it.”
Products with similarities already in the market is something which firm has to consider. It is important to find at least one core thing to differentiate the product from competitors as interview showed:

“The basic idea was same, but from the beginning our aim was to reach continuous measurements...this enables that we can adjust the process in real time which allows for optimization which is why we can achieve cost savings in the process.”

Support from advisors can help for making decision to continue developing. Forming a good team is essential at the very beginning. A good team works with collaboration within team members and develop the product together.

“He sees this as very potential thing and encourage us to go further.”

“After spinning the company out there has been four members in core team and few other a smaller partner. They are bringing additional skills from potential sales channels and maybe something relating to production.”

When firm survey their possibilities to differentiate from competitors, they have to figure out costs relating to development, how the product can meet customers’ needs as well as possible and how competitors are responding their actions. In game theoretic approach can illustrate the situation where firm has an innovation and it considers starting commercialization process. Firm has to think its position relating to competitors and what is that added value it can provide for markets. Commercialization process starts with idea development. At the very beginning there is only some knowledge and willingness to start commercialization process. Start-ups are seeing as innovators because even the lack of resources they have willingness to grow and create a successful product which to commercialize. This situation is a game of chance because this is the decision that start-up is made without another player involve. The nature is affecting the decision because it depends things like skills.
Tutli-project is organized by Business Finland (Referred 1.4.2018) and it is important especially for start-ups who doesn’t have that much resources or knowledge to commercialize activities yet. Being in Tutli-project offers knowledge base, possible advisors, and financing. Tutli-project might be an impulse to start commercialization process:

“Tutli-project itself was the impulse to take this in a commercial direction.”

One strategic decision to make is when start-up decides when it applies in Tutli-project. When technology development or direction of commercialization is not that clear yet, there might be possibility that firm doesn’t get all the benefits or use the full potential when involving the Tutli-project.

“Tutli-project comes a little bit too early...We weren’t sufficiently that far in what had been the ideal stage.”

“If we had started Tutli-project when it ended, then we would have been at good phase.”

One interview question was to examine whether the firm has made strategy to commercialization at this point. Making a strategy helps to keep vision and goals in mind and supports following stages in commercialization process.

“During the Tutli-project we had a lot of ideas and thoughts but were they right, that I can’t answer, maybe we should have been tighter focus.”

“When finding a few core things where we see the possibly potential, then focusing more for trying to find that first paying customer.”

“The strategy right from the beginning is to aim abroad. The Finnish markets are too small. We are happy to get partners here with which to
test and develop the product forward but opening the markets for the product has to happen immediately to the international markets.”

At the early stage of commercialization process, the continuing depends mostly the start-up itself. At this point, the thing which affect most is the willingness of start-up itself. There might be positive impact relating to different accelerators or advisors but at the end it depends on start-up. This early stage of commercialization process can illustrated as a game of chance because the willingness drives start-up toward commercialization but there are things like capability, skills, help for advisors which are available or not so there are uncertainty relating to nature.

Another important question relating to market recognition was asked to illustrate if firm has made market research at this point. Developing a strategy is essence however in small firms it can sometimes be informal.

“We did, but definitely too little during the Tutli-project. We could have done more. We were pivoting pretty much during the Tutli-project because we start from another point of view comparing to where we ended. This was a good thing, but it took time our market research.”

“I can add that our models like how we operate weren’t ripe enough at that time. We just think too much that because the product wasn’t ready then there is no sense to think markets.”

Marketing research is important and making it properly at early stage helps survive further stages. Interviewee was recognizing this also and thinks that activities after spinout may have been easier because of good market research.

“Probably yes, if it were addressed more at markets and recognize better the customer’s needs and potentially scaling market so, to focus in core activities would be easier when you know the target.”

To get full potential in different projects, it is important to timing the project right. Projects offer knowledge and other resources which are usually limited in start-up
company. If the timing for project is right, then firm utilizes it the best possible way but knowing the right time is something that firm has to decide. Accepting the project at the right time offers benefits for later stages also because the strategy is clearer. At game theoretic approach this can be illustrate as game of chance. The firm is the only player, but it doesn’t control all the outcomes. It can partly control the outcomes for example signaling it willingness or capable to involve a project. However, if the time is not right or there are not any projects available then firm can’t involve, and it has to change its strategy.

Every firm face challenges and recognizing them can help and support fluency of commercialization process. At this stage the challenges which became apparent during the interview were several.

“Developing a team and forming roles to everybody was something to consider. “

“Because our technology wasn’t as mature as it should have been in the beginning of the Tutli-project, this caused a lot of pain to solve.”

“Much could have been done differently, like focusing on market research and figuring out we are going to build this firm.”

5.2 Innovation development

This theme manages the issues from developing and manufacturing innovation into products. Innovation protection is core thing when facing the competitors. Also, competence and capability relating to market entry are describing in this section. Competitors actions are usually affecting firm’s strategic decision-making and when recognizing this, can help to control risks and competition.

Relating to this stage the interviewee was asked about their position in relation to competitors and is there similar products in the market which affect their actions. Considering the actions of competitors, firm can create effectiveness and differentiate itself toward competitors.
“There is competition of course, but there is not a similar product. So, we are quite unique position in the market.”

“There is competing technologies and well a lab is one clear competitor. Other methods cannot measure for example very low contents and we are extremely effective to this.”

“There is competition, but we can offer a clear added value to the markets.”

Market entry timing requires the firm consider things like state of enabling technologies, customer expectations and threat of competitive entry. Firm should also consider how competitors actions affect their decisions. Going first in the markets with innovation can provide brand loyalty and network externalities.

“Competitor analysis is a continuing process. Competitors actions are not affecting yet in our actions, and we have not clearly change anything relating to competitors. “

“We have gathered good feedback among customers during the product testing. Our dialogue with potential customer has always gone forward from the first stage.”

At this point on commercialization process it is important to find out customers’ expectations and discussing with them from possibility to test the product. This can be seen as a negotiation situation between the potential customer and a seller. This situation can be illustrating as a game tree form. The start-up is making a first agreement to ask whether the potential customer wants to make agreement for testing the product and giving feedback. The opponent is accepting this offering or rejecting it and making then a counter-offer. This situation is described below.
There are many ways of protecting innovation. Different protection types have different features, and some protect method suits better for some companies than others. It is firm’s decision to choose relevant protection method. Having a patent may also have positive impact for example when negotiate with investors.

“We have a patent for the parts of the product since we are talking the whole analyzer.”

“Patent is creating clear added value among investors and is substantive part this kind of business.”

The framework from Datta et al. doesn’t consider the role of investors. However, in the interview there was mentioned that investors and projects are core thing for start-up. Because there is not that much money ready than some big, stable companies have start-up needs projects and other supportive things to get the money.

“When we were in the Tutli-project we had money.”

“During the Tutli-project we contact with investors quite little. Now at the later stage when the company has spinned-out we have had active discussions with different parties.”
“The investors have reacted well in this product. We haven’t take any money yet, but I don’t see it is forming as a challenge that we don’t get the money.”

“We have raw version strategy to get money. It is living day by day. We are trying to reach a certain type of maturity before taking money, so that we can get money with better terms.”

Money and other resources that investors can offer are vital to the start-ups because usually the knowledge and financial resources are missing in some parts. When demonstrating the negotiation with the investors there is the situation where players are seeking maximum benefits. Investor wants profits for their investments, so they are looking potential firm with high growth expectations. Firm is looking for money and long-term support to continue commercialization process and bringing the product successfully to the markets. Investors usually have distribution channels and other resources ready and potential firm can utilize these if the negotiations with the investors are going well. There is a situation where the players have some incentives to cooperate and share information of their actions. The firm has incentives to tell its patent for the product because the investors are looking for it and it offers value when negotiating investments. Both players are maximizing their benefits but negotiating to get the best solution. This can be seen as a cooperative game which occurs if both players act like that the mutually beneficial outcome can be obtained.

The interviewee was asked to describe, how their strategy would change if they take money at this stage. Using money show investors, the commitment and if the team has motivated to do their best. A firm seeks also other resources than money from the investors.

“Primary focus in that money should be that we are going to build selling channels and starting to think how we get the product first in Europe and Scandinavia and maybe also North America if we found potential partners there.”
“The purpose is to build long-term business, we are not aiming two years exit.”

“We are looking that one scaling market and we have to make product tests with the customers and of course we want, and we are asking money from the customers, but that money is not very likely to cover all costs relating to that we are going through one segment properly.”

“First place we look forward to the investors experiences from commercialization because our team has no experience. We are also looking for the people who are going through this process.”

Challenges at this stage were also recognized. Different challenges during the commercialization process affect the decisions firm should make.

“This is the technology which is probably not fitting customer’s processes as it is, but we maybe have to variate it a little. We can’t do it for free. This depends how much benefit it will bring to the customer and if it brings enough benefits, then they are ready to make a sacrifice.”

“There is challenges every day. We are testing the product and the recognize some problem which is solved and fixed and then testing again.”

5.3 Deployment of innovation

Innovation deployment is the last stage of commercialization process according to Datta et al. Deployment stage includes development and deployment for supporting to create fluent and continuous selling and distribution channels for the product. This stage also gives instructions to think pricing strategy, launch time and distribution, marketing activities. Development activities consist of decisions to manufacturing in-house or collaboration, launch-pad and process of developing the innovation.
Well-managed pricing strategy gives a base to plan next strategies and possibilities to compete with price if firm wanted. Always competing with price doesn’t fit firm’s strategy or product strategy at all.

“Price is not the most essential thing. We want to isolate with added value.”

“Of course, the price always has some extent, but it depends a lot of the strategy which we are selling. If you are selling a big machine, the investment decisions processes are more difficult comparing to sell a service.”

“We have an idea about the price, but it depends on that how much benefit it will bring to the customer especially when process industry the investment should be paid back as soon as possible.”

“These are things which we are researching all the time, how we are selling, are we selling as service model and which industry. When we talk more with customers we then recognize and understand the most effective way to go to the market.”

At this point the pricing strategy is important even though the main purpose of the company is not competing with the price. However, there is competing products in the market and in some parts price is affecting customers’ decisions. When forming a price for the product, there has to calculate variable costs and fixed costs to place the price in good position when comparing the competitors price. When the price is right and product value for the customers is high then the firm earn market share and competitors may lose customers. Even though the price isn’t the most important thing to the firm toward competition, when knowing the costs for the product it could be beneficial to compare own price to competitor’s price. Pricing strategies which are mostly used are penetration and skimming. When using a skimming strategy, the price is setting high and if the strategy is to use penetration, then the lower price is setting. At this point there can be illustrate a situation where are two firms and both have two alternative choices. To choose penetration pricing (P) or to choose
skimming pricing strategy (S). If both firms, choose penetration the purpose is usually to conquer markets quickly. At this point there is possibility that they share markets and customers. Price skimming is opposite, and the purpose is to get back costs which are caused manufacturing and testing. in this strategy the price is first high and then over time, the price will be lower. When choosing a price skimming strategy, there is possibility that some customers are choosing the lower price and then the company who sets the high price loose some customers. In this situation, if we ignore the thing that in real life some customers are for example brand loyal and they don’t care the price that much or some of the customers are always choosing the lowest price and making comparison. Thus, in this situation and game we can assume that if the firm sets low price it gets the customers in the market and if it sets high price, it loses the customers. This can be described as game matrix which involves two players.

<table>
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<tr>
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<tr>
<td><strong>P</strong></td>
<td>0, 30</td>
<td>25, 25</td>
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Figure 5.2 Choosing a pricing strategy

However, this is not taking into account that at early stage start-up there might be informal strategy for pricing and there might not be knowledge about competitor’s price. The figure above only shows how the start-up can utilize game theoretic model when forming their pricing strategy.

The interviewee was asked whether they have partners when manufacturing the product and how they communicate with them. The interviewee was also asked to describe what kind of criteria he could think that partners are choosing their firm.

“*We are searching strategic partnerships. If there is paper mill and we are selling them two full-time workers and device which should control 300 million euros process, so there is a question that are they dare to take it. Can we promise that it works there for 20 years and if we are going to make bankruptcy next, so what then.*”
“We can go directly in some markets, but we need strategic partnerships to reach some other markets.”

“We are starting the dialogue with the customer and together we are thinking those phases where we can provide added value at customer’s process. We are not knowing customers’ processes that well so there need to be communication and thinking together the best solution.”

In game theoretic perspective there is a firm which is considering it possibilities to find most potential partners. Partners are also looking for that firm can produce added value to them. Based on the discussion between the parties both are making strategic-decision at their own, if they want to accept the collaboration contract or not.

In this stage the firm should think launch time and market preparations.

“Our goal is, that we launch the product in this autumn.”

“The investors like the idea that money is coming, and we are quickly launching it. But we already have projects which we are asking money for the customers, so investors see a value and they see that we have the ability to act in the market.”

“We are bringing added value in the market even though the money is not coming from selling the products yet. Our team can deliver things and team is the thing that investors are very much emphasized.”

Communicating value of the product to customers and other stakeholders is important. Problems in communication can lead misunderstood or lag of information sharing. Sales promotion can help with communicating the value.

“This is difficult to understand for people who don’t know anything at the field where we are operating. Explaining the potential and
usefulness of the product is difficult. There should be able to communicate the value of the product better."

“We are focusing to make contacts with strategic partners. Also, when we are looking for the advisors we are also hoping that they are helping us to improve communication.”

One core decision to make at this stage is to decide which distribution channels are the best for the firm and strategy to bring product to the markets or is it best for the firm to sell the product directly to the customers. Relating to this interviewee was asked if they have strategy when choosing distribution channels.

“This is the thing which we are sort out all the time. In essential roles there are also these strategic partnerships.”

“Distribution channels and maintenance channels are things we have to manage. Maintenance channels are bigger problem from these two because the analyzer requires maintenance at some point so we have to solve how we manage this because it is laborious to send one guy to switch the screw.”

“We are not yet discussed with distributors because the product is not that ready yet. Of course, we have plans if somehow the product is not ready in autumn this year. Then we have to think how we adapt the situation. The decisions we have to think are for example, do we have to take money or if we sell more projects then we maybe get along without.”

“This is going case by case. It depends on the customer. Is it about customer where we have to go with strategic partner. But the purpose is that to keep this whole thing in our hands.”

At this point every market have to create own strategy about how to go there. Distributors are looking for loyal partner with good product. At the end of the
commercialization process there is the decision of launching the product. In game theory approach, if Firm A is developing a product innovation and consider whether it should come to the markets or not. If in the markets, there is Firm B with competitive technology and product, but the product is different in a fundamental manner. Then Firm A should think that if Firm B make improvements to its products and offer added value to the customer then A has to think its strategy again.

Challenge at this stage was recognized

“Challenge is to focus and recognize the market we are coming for. We have to think whether we want to focus one market or bring ourselves to everyone’s awareness.”
6 CONCLUSION

At this section the research questions are briefly answered relating to the research findings. The purpose of the research was to examine, how commercialization process can go and how game theoretic approach can support the strategic decision making in different phases of the commercialization process. The start-up company which was select to the interview is an early stage of their business. The results of the interview were successful and rich relating to commercialization process. In game theoretic perspective, the results were hoping to be more satisfy. The interview showed clearly what kind of commercialization process they have at this point and were they want to go. The framework of Datta et al. support almost in all parts the results find in the interview. Findings also support that fact that process is not always going linearly. Next there is presented a figure which combines the activities of commercialization process and strategic decision making based on the research findings and theory.
In the figure above there is used three main stage which was recognize in Datta et al. framework. Under these main stages there is collected activities relating each phase. These activities were found most relevant within research findings, so they are collected under each stage. Sub-themes are taking off in this figure because usually when startup starts its actions it has clear vision of its innovation so the first two sub-themes relating to innovation source and innovation type wasn’t seen that relevant at this point. Innovation protection usually comes at early stage of innovation development. Also, negotiations with potential customers, competitor analysis and market research which are relating market entry planning are activities which are continuing during the process as the interviewee said. At the last stage there was sub-themes relating to development and deployment. These were also take off to this figure because the aim was to highlight that the process is not linear, and activities are depending on the situation. Also, in startup companies there is learning during the process and strategies aren’t that clear yet. Another purpose of this figure is to highlight that strategic decisions are made during the whole process and those decisions depend on the situations and the firm who is commercializing innovation. Funding and other resources which investors can offer to startup are highly important and the third purpose for the figure was to show that. Next the research questions are answered individually.

The first sub-question was: **how commercialization process proceeds in start-up company.** Start-ups can have different backgrounds about how they start their business. One common way to start is with university support. Different projects like Tutli or Tekes can funding the research project and it can later decide how to continue its business. The commercialization process always starts with idea. Because start-up usually born around idea, start-ups are core position when creating innovations. Idea perceiving leads product development. Product development requires resources like money and knowledge. It is common that product is first developed and then testing and developing again before it goes to the market. There is different projects and accelerators to help in product development. After product development and during the tests, firm has to start preparing market entry, launch time and how to protect the product toward competitors. Market entry includes decisions of distributors and negotiations with them and choosing marketing channels. The framework from Datta et al. is general model for commercializing
innovations and thus it is not telling the one and correct way to commercialize the innovation. Innovation commercialization always depends whether it is product or process innovation, totally new or improved innovation and resources available for the firm. There is thus differences between start-up firm and already existing firms who have more resources and knowledge for commercialization.

The next sub-question was: **what challenges includes in different phases at commercialization process.** At different stages there was different challenges. Recognizing these challenges helps clear decision making and makes further stages more fluent. At first stage the challenges recognized by the interviewee was forming a team and built the technology more ready. There should also have done more market research at this point to recognize the first potential customers and most profitable market. At the second stage the challenges faced were the product differentiation to fit in every customer’s processes. This is requiring money because always the technology doesn’t fit for certain customers as it is, and it needs to be customized somehow. Also testing the product and then making changes needs money and time. At the last stage the challenge is to focus the most potential market and decide if the firm wants to focus achieving market segment by segment or bringing themselves awareness of everybody at the same time. Recognizing the challenges can help to keep main goals in mind and focusing to do right things. However, the challenges are also depending on the commercialization situation and every firm doesn’t face the same problems. Especially in start-ups the most critical challenges are the knowledge and money at all stages.

The last sub-question illustrates **what strategic decisions are made in different stages.** At the first stage the first decision to make is to compare own product in existing products and think whether the commercialization process is continuing. The next decisions to make are relating to search funding and different projects to help with different activities of commercialization. Start-ups are usually venture capitalist funding or then they apply in different accelerators like Tutli-projects to get first funding and continuing the commercialization. So was at this case. The second stage involves decisions of innovation protection, market-entry competence and position relating to competitors. Innovation protection is critical decisions because it affect competitors’ capability to copy or develop same kind of product. At this point there
might be need for money if the company is not anymore involved in accelerators. This is when negotiations with investors usually start. At the last stage the decisions are made to finalize the commercialization process. Pricing strategy and choosing distributors require strategic decision-making.

The main research question of this study was: can game theory support strategic decision-making during commercialization process in start-up company. Game theory is using as an approach when examine strategic interaction. It is widely used in different research fields. Game theory aims to find optimal decisions for the players. In this case another player is a start-up who is going to commercialize its innovation. Depending on the situation another player can be investor or competitors or distributors or nature itself.

The research findings show that most common game theoretic approaches and models to utilize are games of chance, cooperative games, negotiation, and game matrix when choosing pricing strategy. At the early stage of commercialization process, the willingness of start-up firm plays a crucial role. The positive impact of advisors can help to make decision to start commercializing the innovation but even though there aren’t resources yet, the enthusiasm of entrepreneur and team are enough to make the first strategic decision.

In different phases of commercialization, the start-up usually negotiates with investors, distributors, and potential customers to gain feedback, money and help to get innovation to the market. During negotiation the aim is to accept an agreement which is useful to both parties. The cooperation usually occurs somehow because both parties will seek the best solution and usually if the opponent has something the other is really interested in, then both are somehow seeking to cooperation that the agreement is accepted. This is also related the cooperative games in different phases of commercialization process. In cooperative games both parties are searching mutual benefit. Game matrix can be utilized when choosing between different strategies. The matrix is easy to count possible outcomes of two players.

As a conclusion for the main research question, the game theory can help illustrating some situations during the commercialization process. However, these findings
present in the chapter five are formed on the basis of the theory about how commercialization process can go and what stages and aspects there are involved and supplemented with the answers of the interview. In this research, the interviewee was an entrepreneur for start-up company. The company is at early stage and the product isn’t ready yet, but they are testing it with different potential customers. So, the answers for the interview are inadequate in some parts relating to game theory.

Thus, the research findings are formed and illustrate based on answers at the current situation of the start-up and the theory basis. I argue that these findings and models are not suitable for every start-up company. However the purpose was to create a knowledge, what stages the commercialization process includes based on the theory and compare the theory in one real life start-up company.
7 DISCUSSION

This chapter presents theoretical implications, managerial implications, limitations of the study and suggestions for further studies. The results of the study are discussed within these four aspects.

7.1 Theoretical implications

The theory of the thesis follows earlier studies and literature of commercialization in general and in start-up specified context. It also discussed the basic game theoretic approaches based on earlier studies and applications of game theory. Strategic decisions are widely relating in commercialization since every stage of the process there need to be done choices which lead an optimal solution. Earlier studies show that game theory is utilizing negotiation, competing analysis and other fields of economics. It is not utilizing in commercialization context. Thus, this thesis offers different field of study.

The findings of the proceed of commercialization process support the theory base. However, there is find one important actor which affect through the whole process but wasn’t taking into account in the theoretical framework of commercialization process. This important actor which is added the framework is investors and other financiers like accelerators and projects during the commercialization process. These are highly important especially in startups. The one purpose in theoretical perspective was to find a framework which illustrate the process of commercialization and gain knowledge if that framework suits for startup. Theory presents general model of commercialization process, but its purpose isn’t to fit every company. In conclusion part this model is customized in some parts touching the answers for interviewee.

Another theoretical perspective was to find ways, how game theory can support strategic decision making during the commercialization process. In the interview, answers relating to this were quite narrow. However, in previous studies there is widely discussed game theoretic applications in different fields of research. Strategies are possible to look within different game matrix, if the company has
knowledge its opponents and if it can think what an optimal strategy is depending on the choice what opponent is going to do. Both parties are trying to achieve best possible strategy and as theory shows, in many economic situations the players of the game are somehow cooperating to gain mutual benefit. Negotiations can be described as game tree and utilize the knowledge you have the opponent. The reason, why the answers were quite narrow is supported by theory, that usually early stage startups have informal strategies and plans about future actions. Based on the theory and research findings I argue that game theory can support decision making during commercialization process and make strategy selection clearer if there is clear strategy about own actions in different phases and skill to think opponents’ actions.

7.2 Limitations

In this part will be discussed limitations of the study. The empirical data is collected from one interview because in the study the focus was to collect deep understanding for commercialization process of startup company. This makes the degree of validity insufficient to generalize of this topic. However, the commercialization process differs between companies, so the generalization wasn’t the main purpose. Thus, the main purpose was to examine whether the game theory can support companies during commercialization process.

In game theoretic perspective the results of the interview weren’t that extensive than the researcher expected. This brings some limitations when analyzing the results and when game theoretic approaches was utilizing for supporting strategic decision-making. The game theoretic models are formed based on the theory and answers from the interview. Because the start-up is in early stage, there wasn’t that much knowledge about the possible actions of the competitors. Negotiations were in the early stages and contract were made with some customers for testing the product. Also, inexperience of the interviewer is one reason the game theoretic approach in the answers during the interview wasn’t that extensive than was the purpose. Forming questions which could support for interviewee to think opponents’ actions wasn’t ask clear enough which due to the lack of experience of the interviewer. However, the game theoretic approaches are utilized in some parts and they are more
general. The research findings are also support the theory that start-ups usually have informal strategies because the lack of resources and economical knowledge.

7.3 Managerial implications

The meaning of start-up companies has increased, and commercialization can be seen vital to the companies at every stage of business. Also, investors are seeing a lot of potential in start-up companies. This thesis has introduced a framework of commercialization and basic approaches of game theory and it also offers suggestion about how game theory can support the decision making during commercialization process.

Entrepreneur which was interviewed is from the start-up which is launched 2017 so there wasn’t that much knowledge about actions of the competitors or negotiations because the product is not launched yet and the firm is at early-stage. That is why the suggestion of using game theory as a support during the decision making of the commercialization process are general and they can be applied to more suitable in own company. The purpose was to create knowledge and framework which start-up can utilize in some part or entirely depending on the situation.

7.4 Further studies

Next there is presented the problems which can lead for further studies at this research field. The target of this study was to examine start-up innovation and how commercialization process can go. Also, the interviewee has a product which is high technological and suits for process industry. Since this study was examining the whole commercialization process it is limited to start-up company with high technology product in process industry.

One interesting problem to investigate is that what kind of differences there is between start-up and large, stable company. Since existing companies usually have more knowledge and resources than start-up the suggestion for further studies is to examine the differences in the commercialization process and how strategic decisions are made within companies who have more knowledge to
commercialization. This knowledge of commercialization process can affect the decision making and imaging the activities of the counterparty which is making the game theory approach different than it is in startup context where the knowledge is limited.

Another field for further research is suggest for examining commercialization in the context of different industry or different product or process innovation. Since the commercialization process is always unique depending on the company, available resources and is it product, service or technology commercialization, the game theory approach can offer different aspects than this study.
REFERENCES


APPENDIX 1: USED INTERVIEW CITATIONS IN FINNISH

Theme 1: Innovation discovery

Mutta nään tyyppillisestähän tän tyyppiset jutut nehän vie aika pitkään, tää on kunnisskin aika semmosta, aika tekninen ja kohtuullisen vaativa juttu toteuttaa niin siinä sitten menee niitä vuoraa helposti ku sitä lähetään ihan nollista käytännössä niin tota kehittämään.

Se perusajatus oli sama...mutta me tähättiin ehdottomasti siihen että päästään jatkuvatoimisiiin mittaamisiiin...Mahollistaa oikeesti sen että me pystytaan prosessia säätämään reaalialajassa mikä mahollistaa taas sitten sen että me pystytaan optimoimaan jollanka pystytaan saavuttamaan kustannussäästöjä sitten siellä prosessissa.

Ja se näki tän niinku hyvin potentiaalisena juttuna ja rohkasii meitä, että menkää ehdottomasti eteenpäin.

Ja tota, sit sen jälkeen kun me spinnattiin se ulos niin sitten mä ja kolme muuta ollaan niinku oltu sitä ydintiimiä, ja sitten muutamat muut pienemmät osakkaita.

Tutli-hankkeen aikanahan rahaa oli tavallaan yllinkyllin.

Nyt sit myöhemmässä vaiheessa kun firma spinnattiin ulos niin siinä vaiheessa tottkat ollaan käyty aktiivisia keskusteluja sitten useitten tahojen kanssa.

Tutli-hanke itsessään oli sysäys siihen että lähetään viemään kaupalliseen suuntaan.

Tutli tuli ehkä pikkusen liian aikasessa vaiheessa.

Mutta ei oltu ihan vielä siinä mikä ois ollu ideaalivaihe tutille. Se missä tutli loppua niin sillon ku ois saatu tutli niin ois oltu todella hyvässä vaiheessa.

Oli paljon ajatukseja, mutta ehkä sen, siis jos nyt puhutaan vielä siitä Tutli-hankkeen ajasta mikä oli oikeestaan se lähtölausun niinku kunnolla tälle kaupallistamiselle niin sillon vielä meillä oli niinku ajatukseja mutta se että oliko ne oikeita niin sitä en nyt pysty ehkä välttämättä allekirjoittaa, ehkä ois pitäny olla tiukempi fokus siinä vaiheessa. Et kun sieltä löyty ne muutama sellanen juttu missä nähtiin mahollinen potentiaali niin enemmän porautua niihin ja etsiä sitä ensimmäistä maksavaa asiakasta.

Heti lähtökohtasesti pyritään globaaliksi. Suomen markkina ei semmonen tota, et tänne voidaan jotain tehdä ja tottakai mieellään haetaan partnereita täältä, joiden kanssa voidaan pilootoida ja testata ja hioa tuotetta eteenpäin mutta markkinan avaaminen pitää tapahtua välittömästi kansaivälistile markkinoille.

Ja tota, sit sen jälkeen kun me spinnattiin se ulos niin sitten mä ja kolme muuta henkilöä ollaan niinku oltu sitä ydintiimiä, ja sitten muutamat muut pienemmät
osakkaat. Tuovat sitten vähän ehkä tommosta lisäosaamista sieltä niinku mahollisten myyntikävien puolelta ja ehkä jotakin tuotantoon liittyvää.

Todennäköisesti kyllä, et jos siinä ois pureuduttu paremmin siihen markkinaan ja ois tunnistettu paremmin se asiakastarve ja se potentialisesti skaalautuva markkina niin se tekemisen fokusointisen jälkeen ois paljon helpompaa. Kun tiedetään tarkemmin mihin tähdätään.

Tehtiin jonkun verran, mutta ehdottomasti liian vähän siinä Tutli-vaiheessa. Olisi pystynyt tekemään paljon enemmän. Mut siinä oli tietysti yksi syy se, että me pivotoitiin aika voimakkaasti tota meän teknologiaa siinä tutlihankkeen aikana, et me lähettiliin tavallaan ihan eri kulmaa liikenteeseen kun mihin me lopulta päädyttiliin, joka oli tottaa vaijäämätöntä ja hyvä asia, mutta se vei ehkä sitten aikaa siltä markkinatutkimukselta.

Ehkä toimintamallit ei ollut niin kypsät. Että siinä ehkä vähän haksahdettiin siihen moodiin että kun tää tuote ei oo valmis niin ei voi näittä markkinoitakaan olkein mielettä.

Ehkä sitten se tiimin rakentaminen, roolitus oli sellasia mihin piti kiinnittää huomiota.

Sitten tietysti se, että kun meillä se teknologia ei ollu vielä niin kypsä kuin mitä sen ois ehkä tullu olla siinä hankkeen alussa niin se oli semmonen et aiheutti paljon kipuila

Paljon ois voitu tehdä toisin esim markkinaselvityksiin keskittyminen ja ylipäättään että miten lähetään yrityskuviota rakentamaan.

Theme 2: Innovation development

Tuota kilpailuahan on aina, koska muutenhan ei olisi kysyntää, mutta vastaavanlaisia tuotteita ei. Et sinänsä me ollaan aika uniikissa positiossa markkinoilla.

Et on niinku kilpailevia teknologioita et on elektrokemiallisia menetelmiä, hyvin niinku vanhoja ja no labra on tietysti yks selvä kilpailija.

Toiset menetelmät eivät pysty mitattaamaan esim. kovin pieniä pitoisuksia, missä taas me ollaan äärimmäisen hyviä ja tehokkaita. Me pystytään tuomaan selkeä lisääarvo siinäh markkinaan.

Jatkuva prosessi. Silmät ja korvat pitää olla koko ajan auki. Ehkä vähän vaikea tässä vaiheessa vastata mutta ei ole muutettu selkeesti mitään.

Lähes poikkeuksettakin me jotain dialogia on aloitettu, jonkun potenciaalisen asiakkaan kanssa niin tota se on edennyt aina. Siitä niinku ensimmäisestä vaiheesta eteenpäin. Hyvää palautetta on saatu.
Patenttiperhe on koossa. Osia tuotteista tottakai meillähän puhutaan koko analysaattorista.

Tutlin aikana aika vähän. Nyt sit myöhemmässä vaiheessa kun firma spinnattiin ulos niin siinä vaiheessa tottakai ollaan käyty aktiivisia keskusteluja sitten useitten tahoja kanssa.

Jokin näköinen, elää päivittäin alku vaiheessa yrityksessä. Pyritään saavuttamaan tietylainlainen maturiteetti mieelleään ennen ku otetaan rahaa sisään.

Siinä vaiheessa kun otetaan rahaa sisään niin primääri fokus siinä rahassa pitäisi olla siinä että me aletaan rakentamaan myyntikanavia ja aletaan saamaan sitä hommaa ensimmäisessä vaiheessa todennäköisesti niinku Skandinaavia ja Eurooppa, potentiaalisesti ehkä vähän Pohjois-Amerikkaan päin jos sieltä löytyy hyvät kumppanit.

Kun me ettiään sitä skaalautuvaa markkinaa niin trialit mitä joudutaan tekemään asiakkaiden kanssa niin tottakai me halutaan rahaa niistä ja me pyydätään rahaa niistä mutta se raha aina mitä saadaan sieltä niin et hyvin todennäköisesti kata naitä realikulujua mitä meille syntyä siitä kun me kunnolla käydään läpi se niinku tietty segmentti.

Ylipäättäään kansainvälistyminen mistä tiimillä ei ole kokemusta niin siihen halutaan tukea. Sitten tietenkin semmosia kavereita, jotka käny tän jumpan läpi.

Tavoitteena rakentaa pitkäkestoista liiketoimintaa et me ei olla tähtäämässä nopeaan kahden vuoden exitin.

Ehkä se fokus on yksi siinä ja se että mihin markkinaalle täältä tullaan ja mitä me tullaan et se niinku et halutaanko me tulla silleen fokusoidusti ja tiettyyn suuntaan vai tälleen hyvin laajasti markkinoille. Tuoda itsemme niinku kaikkien tietoisuuteen.

Puhutaan tälläsestä teknologiasta niin se ei välttämättä istu sellasenaan kaikkiin mahdollisiin sovelluksiin yhtenä tuotteen vaan se voi vaatia niinku variaatioita. Ilmaseksi ei voida tehdä. Mitkä vaatii aina työtä ja se onko asiakkaita valmiita sitten maksamaan siitä työstä että sä varioidaan siihen heidän sovellukseen, että se riippuu taas siitä että miten paljon hyötyä se tuottaa asiakkaalle, että sitten jos se tuottaa tarpeeksi hyötyä niin sittenhän ne on valmiita tekemään sen uhrauksen sitten.

Haasteita on päivittäin. Paljon asioita huomataan kun testataan ja sitten korjataan ja sitten testataan ja parannetaan.

**Theme 3: Deployment of innovation**

Onhan meillä se pointti tiedossa suurin piirtein, että mihin me tähätään. Se elää vielä sen mukaan että miten ison hyödyn se tuottaa asiakkaalle.

Hinta ei oo se oleellisin juttu. Siellä se ehkä tuotettu lisäarvo on kummiskin sitten se millä me halutaan erottua.
Varsinkin kun tuollasessa prosessiteollisuudessa investoinnit pitäisi saada maksettua mahdollisimman nopeesti takaisin. Et nää on tottakai sellasia asioita että mitä koko ajan selvitetään. Ja sitten se että mitenkä me myydään, myydäänkö me palvelumallilla mikä teollisuuden alalla.

Sitä mukaan mitä me jutellaan asiakkaiden kanssa niin sitä enemmän me aletaan ymmärtää sitä että millä tavalla sinne markkinaalle on fiksuinta mennä sitten.

Ylipääätään kansainvälistyminen mistä tiimillä ei ole kokemusta niin siihen halutaan tukea. Sitten tietenkin semmosia kavereita, jotka käy ny tän jumpan läpi.

Haetaan strategisia kumppannuja. Jos mietitään paperitehdasta vaikka ja sä myyt sinne kahen hengen pumpuuna kaks täyspäivästä työntekijää niin laitetta, jonka pitäs ohjata 300 miljoonan prosessia, niin tota uskaltaako ne ottaa sen sinne. Pystytäänkö me lupaamaan, että 20 vuotta ja voidaan luvata että toimii siellä. Ja jos me ollaan ens viikolla konkassa niin mitä sitten.

Et siinä me tarvitaan strategisia partneruuksia, voidaan mennä itse suoraan jonkekin ja voidaan mennä heidän kanssa.

Me alotetaan dialogi ja sitten mietitään yhessä missä vois olla kipukohtia, että tuotetaan lisäarvoa prosessiin. Me ei tunneta niin hyvin prosesseja kuin strategiset kumppanit. Sit aletaan porukalla miettiin aletaan testaileen ette voisko tää toimia tässä.

Pitää ajatuksesta että nopeesti saadaan markkinaalle se ja nopeesti alkaa myyntiä tulemaan. Mut sitten tota meillä no kummiski silleen hyvää että meillä on maksullisia projekteja, joista asiakkaat maksaa meille jo nyt, niin näkehän ne siinäkin jo huiken arvon, se on itsessään osotus siitä että meillä on kykykkys toimia tuolla markkinassa.

Me tuodaan lisärvoa sinne ja vaikka se nyt ei o so suoraan tuotteen myymistä niin meillä kuitenkin tiimillä on kompetenssi deliveroida asioita ja tiimihän on kuiteski se mitä sijoittajat painottaa hyvin paljon.

Mikä on koko ajan selvityksen alla. Siinä on myös oleellisessa roolissa nää maholliset strategiset kumppanit et tota jakehukanavat ja huoltovanavat, molemmat, on semmoset mitkä pitää tyettysti hanskata. Huoltovanat on ehkä se suurempi kummiski. Analysaattorista niin se vaatii vääjäämättä huoltoa. Niin se on isoihista aina lentää sinne vääntäämään jotain ruuvia että se pitää jollain tavalla sitten hoitaa.

Ei ole käytty vielä hirveästi keskusteluja jakelijoiden kanssa, koska meillä ei kummiskaan ole vielä niinku riittävän valmista tuotetta.

Tottakai meillä on niinku suunnitelma a, b, c, d, e että kun asiat menee vihkoon jollain tavalla niin miten siihen reagoidaan sitten. Siihen pitää vaan sit mukautua siihen tilanteeseen. Että miten me resursoidaan se ja tota tarviko ottaa sitten pääomaa sisään aiemmin. Kuitenkin jos me saadaan myytyvä näitä projekteja niin sitten vo olla ettei tarte vielä ottaa sitä pääomaa sisään.
APPENDIX 2

Haastattelu:

Yleistieto

Millainen ammatillinen tausta sinulla on? Miten olet päätynyt nykyiseen tilanteeseen?
Oletko ollut aiemmin mukana start-up yrityksessä?
Onko sinulla aikaisempaa kokemusta kaupallistamisesta?
Kerro yleisesti yrityksestä? Montako henkeä ja minkälainen toimintatapa teillä on?
Minkälainen oma toimenkuvasi yrityksessä on?
Mikä on tällä hetkellä tärkein tärkeänä teidän yrityksessä?
Kuinka tärkeänä pidät kaupallistamista ja uusien innovaatioiden syntymistä?
Oletko saanut koulutusta kaupallistamiseen yrityksen kaudella? Muuta kautta? Oletko tehnyt muuta, joka edistää tuotteen kaupallistamistavoitteita?

Vaihe 1: Idean ja innovaation syntyminen:

Miten idea nykyisestä innovaatiosta syntyi? Tarvelähtöinen? Asiakaslähtöinen?
Syntyikö se yrityksen sisällä vai oliko mukana ulkopuolisia, esim. tutkimusorganisaatio?

- Minkälainen tutkimusryhmä/tiimi muodostui innovaation ympärille tässä vaiheessa?
- Laadittiinko strategia innovaation toteuttamiseksi? Oliko tiimin kesken yksimielisyys, mitä tuli tehdä innovaation kaupallistamiseksi? Muodostuiko yhteinen päämäärä selkeäksi?

Täysin uusi vai paranneltu jo olemassa olevaa tuotetta?

Mitä arvoa tuotteen tarjoaa asiakkaille? Voisiko sitä parannella jotenkin?
- Miten uskot parannuksen vaikuttavan asiakkaiden kokemuksiin?

Millainen on yrityksenne visio ja strategia? Sidosryhmän vasteen jälkeen mitä teitte?
Oliko teillä strategia ja miten vaikutti vastapuoleen? Arvio mitä siitä seurasi?

Oletteko tehneet markkinatutkimusta uutta innovaatiota varten? Muuttuiko strategianne uudesta innovaatiosta markkinatutkimuksen perusteella?

Miten eri sidosryhmät reagoivat alussa tuotteeneseen?

Onko markkinoilla olemassa vastaavanlaisia/samaan tarpeeseen vastaavia tuotteita?
- Oletteko miettineet asemaanne suhteessa niihin?
- Näetkö jonkinlaisia kilpailutilanteita, esim. hinta teidän tuotteen ja kilpaillevien tuotteiden välillä? Miten hinnan muutos kilpailijalla vaikuttaisi teidän hintaan? Onko tarkoituksena saada alhaisin hinta vai mahdollisesti kilpailu mailla keinoin?
  - Jos kyllä, minkälaisia toimenpiteitä olette tehneet kilpailutilanteisiin liittyen? Onko kilpailijoiden puolelta havaittavissa jotain vastatoimia?

Mitä haasteita innovaation syntymisensä vaiheeseen liittyi?

- Rahoitus? Olitteko tietoisia eri rahoitusmuodoista? Tekes, sijoittajat ym.?
  - Oletteko saaneet minkälaisa rahoitusta tuotteen ideointi vaiheessa?
  - Kuinka eri rahoitajat reagoivat tuotteen ja sen rahoitukseen?
  - Millä tavalla lisärahoitus vaikuttaisi strategiaanne?

- Työntekijät? Ovatko inhimilliset resurssit riittävät?
  - Sovittiinkö tässä vaiheessa yhteiset päämäärät ideoinnin ja kaupallistamisen suhteen?
  - Ovatko kaikki olleet halukkaat toimimaan yhteistyössä yhteisen tavoitteen eteen?
  - Oletteko jakaneet vastuualueita tai tekevätkö kaikki kaikkea kaupallistamiseen liittyen?

- Sidosryhmät (tavarantoimittaja, toimitusketjun jäsenet)? Millaisia verkostojen muodostumisvaikutteita innovaation ideointi vaiheessa?
  - Oletteko tehneet yhteistyötä tässä vaiheessa?
  - Minkälainen strategia teillä on/oli verkostojen muodostumiseen liittyen? Oliko yhteistyökumppaneiden löytäminen vaikeaa?
  - Miten verkostojen muodostaminen vaikutti strategiaan? Tuliko haasteita esim. kommunikoinnin suhteen?
  - Kilpailijat?
    - Minkälaisia haasteita kilpailijat toivat tässä vaiheessa?

Vaihe 2: Tuotkehitys:
Miten suojaatte innovaation?
  - Vaikuttaako esimerkiksi patentti, rahoitukseen saamiseen eri tahoilta?

Paljonko resursoita käytettävissäanne?
Olisiko mahdollista saada lisää resurssseja, jos vähennetään jotain muuta?
Kehitettekö/kehitittekö tuotetta itse vai yhteistyössä jonkun kanssa?
  - Minkälainen strategia teillä on tähän? Miten kumppani reagoi strategiaanne? syntyikö konfliktia?

Oletteko tehneet kilpailija-analyysia tässä vaiheessa?
Miten kilpailijoiden toimet vaikuttavat teidän toimiin?

Onko kilpailijastrategia muuttunut tässä vaiheessa?

Mitä haasteita kehitysvaiheessa on?
- Tuotetestaus? Kuinka se on toteutettu? Oliko teillä strategia ja miten se vaikutti asiakasryhmään, jossa tuotetta testattiin?
- Minkälainen vastaanotto tuotteella oli?

Miten sisäinen viestintä toimii tässä vaiheessa?

Entä ulkoinen viestintä?
- Miten kommunikoitte sisodysyhmille tässä vaiheessa?
- Myynninedistäminen? esim. Messut?

Markkinoille tuomisen suunnittelu? Kuinka sitä on suunniteltu tässä vaiheessa? Onko tässä kohtaa jo laadittu strategia tällä?

Kuinka vastaanottavaisia asiakkaat ovat olleet?
- Onko teillä ollut strategia tuotteen hyötyjen kommunikoinnista asiakkaille? Miten tämä strategia vaikutti asiakkaisiin? Miten he reagoivat ja vastasivat kommunikaatioon?
- Minkälaisia toimenpiteitä olisit tehneet, jos asiakkaat olisivat reagoneet negatiivisesti? Miten uskot että toimenpiteet olisivat vaikuttaneet asiakkaiden suhtautumiseen?

**Vaihe 3: Markkinoille tuominen: mitä kuuluu tähän vaiheeseen**

Onko tarkoitus myydä tuotetta itse?

Jos on, millaisia sisodysryhmäsuhteita olette muodostaneet?

Onko teillä jo olemassa selkeää strategia tähän?
- Miten se on muodostunut?
- Vaikuttavatko kilpailijoiden toimet teidän suunnitelmaan?

Oletteko vertailleet eri vaihtoehtoja tuoda tuote markkinoille?

Millä tavalla vertailu on tehty?

Minkälaisista myynninedistämistä olette tehneet?
- Onko tähän laadittu strategia?
- Miten se on vaikuttanut sidosryhmiin? Millaisia toimia sidosryhmien puolelta on havaittavissa? Esim. myynnin kasvu?

Oliko tilannetta, että olisi esim. kaksi yhtä hyvää strategiaa ja on pitänyt valita vain toinen? Miten tämä vaikutti muihin osapuoliin?

Oletteko tehneet kilpailija analyysia tässä vaiheessa?

Mikä on/oli haastavaa markkinoille tuomisessa?

Miten sisäinen viestintä toimii tässä vaiheessa?

Kuinka olette ottaneet huomioon epävarmuuden ja asiakkaiden mieltymyksen muuttumisen?

- Muutatteko tuotetta asiakkaiden toiveiden mukaan? Mikä on asiakkaiden reaktio tähän? Luoko se asiakas uskollisuutta

**Vaihe 4: Käyttöönotto:**

Minkälainen hinnoittelustrategia teillä on?

- Pitävätkö asiakkaat tuotetanne kalliina tai halpana?
- Jos halpana kertooko se laadusta? Ostavatko ennemmin toisen tuotteet?
- Jos liian kallis? Valitsevatko asiakkaat kilpailevan tuotteen?

Lanseerausaika?

Millaisia jakelukanavia olette valinneet? Mikä on strategianne tähän? Mitkä asiat vaikuttavat jakelukanavan valitsemiseen?

Jos lanceerausaika pitenee jostain syystä, vaikuttaako se miten jakelijasuhdeisiinne? Millaisiin toimiin ryhdytte, jos näin käy säilyttääksenne suhteenne?