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**DATA-DRIVEN DECISIONS IN SOFTWARE PRODUCT MANAGEMENT: CASE
STUDIES FROM STARTUPS**

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ABSTRACT

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Data-Driven Decisions in Software Product Management: Case Studies from Startups

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75 pages, 10 figures, 12 tables, 5 appendices

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During the development processes, the innovative startups companies face multiple challenges. The lack of human resources, project documentation, low level of operation history has a significant effect on product success. In these conditions to get effective decisions, Product Manager has to rely on data. This thesis is aimed to identify main resources for decision making in software startups. The literature investigation of the existing approaches to product management reveals the differences among roles carried out duties of PM in Scrum, Extreme Programming, Kanban, Scrumban. The investigation of current practices of software management allows building the requirement gathering models and defining the main patterns of product management in startups. The main results of research are a matrix and a KPI board. The first one describes the data and sources that needed to Product Manager, while the second one illustrates the main metrics displayed the product state.

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GLOSSARY

Term	Definition
Business Strategy	The document, describing a vision of the company, the motivation for product development.
Data Driven Decision Making	The process of making a decision based on data, metrics, and knowledge rather than on intuition.
Product Manager	The person responsible for product management processes including gathering requirements procedure, requirement's prioritisation, the direction of product development. In different methodologies, PM is called as Product Owner, Customer or Product Champion.
Product Roadmap	The plan contains the long-term and short-term business aims facilitating to the achievement of business goals using technology solutions.
Product Strategy	The long-term oriented plan for the product. It gives a response on questions: where and how we are planning to come.
Stakeholder	The business part that has an interest in a company, and can either affect or be affected by the business.
Startup	Company with short operational history (less than five years) developing innovative new products, services or processes.

LIST OF ABBREVIATIONS

B2B	Business to Business
B2C	Business to Customer
CEO	Chief Executive Officer
CTO	Chief Technology Officer
FDD	Feature-Driven Development
KAM	Key Account Manager
KM	Knowledge Management
MLC	Monthly License Charge
PM	Product Manager
PO	Product Owner
RP	Requirements Prioritization
SPM	Software Product Management
XP	Extreme Programming

1 INTRODUCTION

Startup companies grow in conditions of uncertainty and strict resources (Unterkalmsteiner et al., 2016). According to statistics only thirty-fourty percentage of startups survives in a first five years. At the same time, the seventy-eight percentage of investments even aren't paid off (Nobel, 2011). There are several reasons for that. Wang et al. (2016) conduct a large survey in 4100 startups with 8240 respondents in total. It shows that during development process startups face various challenges from finding the niche to acquire funding. However, according to the results the significant majority of respondents (859) consider the building product as the biggest challenge for this type of companies, 560 respondents notice it as the second greatest challenge, and 327 respondents guess it as the third one. In general, 1746 respondents take it as the biggest obstacle while all others challenges such as customer acquisition, funding, team creation are following next (Wang et al., 2016)

Building product is a complex procedure involving almost all divisions of the company. The main discipline which provides best practices and could be used as a guideline for product creation is the product management. According to definition Software Product Management (SPM) is “the discipline and role which governs a product (or solution, or service) from its' inception to the market or customer delivery in order to generate the biggest possible value to the business”. Ebert (2007) defines the business success as “the success of the product manager with his team”. The empirical study of Maglyas, Nikula and Smolander (2013) confirms this statement, it shows that applying SPM practices facilitates decreasing of development cycle time on 36%.

Applying of product management techniques helps to overcome the main challenge of startups. However, current frameworks are overweighed and become obsolete due to the new approaches to the development process and rapid development of information industry as a whole. Moreover, due to the different reasons as limited resources, the immaturity of products and processes, startups do not pay enough attention to product management in the company. It might be wrong of them, especially taking into account the fact that embedding of product management practices in the company increases the effectiveness.

The existing research in startups activities is mainly focused on the challenges with what young companies faces (Bosch, Holmström Olsson, Björk, & Ljungblad, 2013; Wang et al., 2016). There is another research exploring a particular area of product management related to user experience (Hokkanen et al. 2015) and presenting approaches for user analysis and feedback collection. Current study is aiming to investigate variety practices for applying product management practices in startups, focusing on data management approach in particular. Besides, this work is focused on the developing startups who are already passed the “early stage” from idea to market. This type of companies are aiming to customer acquiring.

According to KPMG Project Management Survey (G Barlow, Woolley, & Rutherford, 2013; Gina Barlow, Tubb, & Grant, 2017) the project management activities are growing. In 2013 54% of respondents claim that they completed more than 21 projects whereas in 2017 in 40% of organisations this indicator had risen to 30. Also, using of Agile methodology is gaining in prominence in recent years to 43% from 2013 to 2017 (Gina Barlow et al., 2017). All these facts effect on modern product management practices in the organisation. Therefore, this question requires to be explored. The research is built in following way. The first part introduces the background of the research, aim of study and research questions. The second one explains the research methodology using in this study, while the third one includes the literature review of existing approaches to product management. The fourth part presents the analysis of data gathering in the frames of case study while the fifth part contains the main findings and discussion of this research. The last part draws the line of this study and includes contribution, limitations and discussion.

1.1. Software Market Overview

The software market industry is the fastest growing industry in Information Technology (IT) sector. Despite a slight decrease in 2015-2016, Gartner research predicts the growth of overall IT sector for 2.7% approximately from 2017 to 2020 (Gartner, 2016). This tendency can be explained by the fact that the internet is becoming a popular delivery channel and a successful digital marketing tool. More and more consumers of IT and software realise the value and benefits of using new technology.

The whole software market could be divided into two parts – hardware manufacturing and software development. IT equipment is a tangible product, and everyone can imagine the creation of it in common features – scheme, details creation, assembly, testing. However, how to manage the creation of intangible intellectual software product? Software Product Management (SPM) research domain answers to this question by providing guidelines for developing a successful product. The main aim of Software Product Manager is to make sure that product is developing in accordance with current customer needs and will meet his customer (Ebert, 2007).

The responsibility of Product Manager (PM) is variable from company to company. According to Product Management insight research (Fishbein & Frome, 2017), the most common responsibilities for product managers are related to deciding what to develop. Thuswise, the vast majority of respondents (76%) replied that their main activity is setting roadmap, 71% - writing user stories, 59% - customer interviews, 50% - managing development team. While roughly a quarter of respondents are responsible for revenue targets or P&L, 26% and 23% respectively. However, the success of developing a product highly depends on the functionality or features of the release. To create demanded product PM has to rely not only on intuition but preferably on data. As this data is fuller as it is more qualitative. Therefore the decisions are more efficient.

SPM practices are actively used in huge corporations. Nowadays attracted by the perspective of IT market more and more companies are entering the software market as startups. Small companies have inherent characteristics as distinguished from the maturity players and huge frameworks are not applicable to them. Therefore, they face the problem of lack of SPM practices. What is the SPM solution for startups? On what SPM data

company has to pay attention developing the new innovative product? These questions will be highlighted in this research.

1.2. From Data Science to Knowledge Management

In conditions of the modern world to be successful enterprises have to make their decisions be times and based on the incredible amount of information (Mosley, Brackett, Earley, & Henderson, 2009). According to statistics from International Data Corporation (IDC), the volume of data increased by nine times from 2006 to 2011, and this tendency will grow stronger over the next years. The knowledge about customers, potential market, new trends in technology gives competitive advantages to the company. Consequently, the data is considered as a vital asset of the company. The right applying of it allows to organisations make their decisions more efficiently. Therefore, more and more organisations refer to data science.

To understand “what is a data science?” we should request to the definition of data. The main concepts of data science are data, information, and knowledge (Mosley et al., 2009). Data is defined as a set of raw facts in different formats. Information is a combination of data and business background that includes a definition of terms, format, time frame and relevance. Knowledge is the next level of information presentation. It interprets the information in context depending on experience and the expectations of people (North & Kumta, 2014). The main types of data are presented in Figure 1.

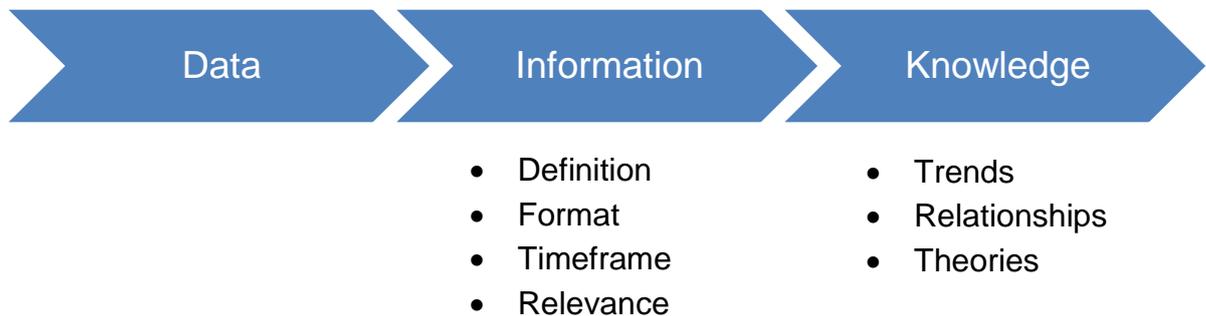


Figure 1. Types of Data (Mosley et al., 2009)

Based on the explanation of cited concepts the data science could be defined as a combination of principals for transferring data into information and knowledge (Provost &

Fawcett, 2013). The notion of data science is closely related to the data mining. In turn, the data mining is described as a process of extraction of valuable information by analysing data (Berry et al., 1994; Shaw et al., 2001). This process also implies applying a lot of techniques like data mining algorithms, decision trees, statistical analysis for more effective exploring of huge databases (Shaw et al., 2001). Nowadays, there are more and more software products using as a tool for data mining on the market. Big data technologies are not an exception. Popular solutions for work with big data such as CouchDB, Hadoop, HBase and others are intended to support achieving the goals of data science.

At the same time, it is important to note the difference between Knowledge Management (KM) and Data Management. Data Management operates raw information getting from different resources whereas KM is the continuous process consisting from getting, organising, maintaining, applying, sharing and updating of knowledge in organisation aiming to increase the effectiveness of company (Kokol, Žlahtič, Žlahtič, Zorman, & Podgorelec, 2015). The next stages of KM are operative Knowledge Management and Strategic Knowledge Management (North & Kumta, 2014). The essence of operative KM lies in transferring tacit knowledge into explicit to understand how to apply knowledge to actions. In turn, the highest field of strategic KM implies an understanding of which knowledge and actions are needed to ensure market competitiveness in regard to company's objectives. Because one of the main goals of KM discipline is an integration of information from the different point of view to create a complete vision as a base for the decision-making process (ALAmeri, 2015; Courtney, 2001; Kokol et al., 2015).

1.3. Data Driven Decision Making

In conditions of the modern world, business is intimately connected with the decision-making process. The price of a wrong decision in business is extremely high. Therefore, everyone strives to make correct and optimal decisions (ALAmeri, 2015). Decision-making process could be based on intuition or data. Decisions based on intuition could be justified by the critical situation when decisions should be made immediately. In turn, data-driven approach implies that the basis of making decisions is data, not intuition.

The confirmation of the effectiveness of the data-driven approach in decision making is research conducted by Economist Erik Brynjolfsson (Brynjolfsson, Hitt, & Kim, 2011). In the article, he statistically figures out the positive effect of a data-driven approach to business. According to his research conducted in 179 companies, firms practicing data-driven approach in decision making have performance indicators on 5-6 percentage higher. Moreover, researchers find out that this trend also was noticed in other dimensions such as using of an asset, profitability of equity capital and market price.

Moreover, apart from high business value, business decision making procedure is inseparable from a high level of responsibility. Persons, who can make optimal and rational decisions in stressful conditions, are highly appreciated in business. Companies understand the value of decisions and utilize new technologies and software tools facilitating to alleviate the task of managers (AlAmeri, 2015). It also makes the decision-making process more automated to decrease costs on personal. Therefore, the number of industries implementing solutions for automation of decision-making process is constantly growing since 1990s (Provost & Fawcett, 2013). However, it is worth to mention that there are professions that couldn't be fully automated.

1.4. Software Product Manager Role

The product manager (PM) role exists for more than 70 years (Gorchels, 2000). The responsibilities of this position are changing over the years. However, the essence of this role remains constant. "Product Management is the discipline and role, which governs a product (or solution or service) from its inception to the market/customer delivery in order to generate biggest possible value to the business" (Ebert, 2007). The role of product manager is also can be illustrated as a "voice of customer" inside company (H.-B. Kittlaus & Clough, 2009). He or she has to understand customer needs to deliver the right product on time. At the same time, PM has to track an incredible amount of information from different resources.

The role of PM is extremely close connected with decision-making process. The PM has to take into account interests of internal and external stakeholders and to find a balance between customer's expectation, partners view and departments opportunities. Product management activities include continuous interaction and collaboration with engineers,

developers, analytics, marketing and sales managers, project managers, designers (Maglyas et al., 2013). Therefore, PM is also considered as a ‘mini-CEO’ of the product (Dver, 2003; Gorchels, 2000). However, dependency on different departments could lead to conflicts caused by the absence of direct submission of other departments to product manager (Gorchels, 2000).

Responsibilities of PM vary from company to company. Several frameworks describe product management responsibilities in enterprises and startups that will be reviewed in details in chapter 3. The most common responsibilities of PM include product requirements management, release schedule and development stages to bring to the market success demanded product (Ebert, 2007). Conditionally all activities concerning product manager’s duties could be divided into outbound and inbound. The first group includes setting strategy and roadmap design that implies marketing research, while the second one contains an analysis of competitors and market trends.

The success of whole product greatly depends on product manager’s decisions. PM decides how the product will look like, what functionality it will provide how much it will cost. To make these decisions, he needs take into account interests of a lot of stakeholders and also capabilities of whole company’s departments. It is worth to mention that term of a product manager is not used in modern enterprises. Due to applying of different methodologies, it is replaced by product owner or product champion or customer. The differences between these definitions are presented in literature review section.

1.5. Aim and Goal

The aim of this study is to investigate the data-driven approach for product management in international startups. In accordance with the aim, the goal of this study is to identify main resources for decision making in software startups.

1.6. Research Questions

Research questions facilitate the achievement the aim and goal of the study. On the basis of the research aim and goal, we define research questions (Table 1).

Table 1. Research Questions

№	RESEARCH QUESTIONS
1	What are the existing approaches to product management in software companies?
2	What the current practices of software product management in startups?
3	What kind of data is required to product manager needs for making decisions and what the source of such data in a startup?

1.7. Delimitations

This study was conducted in frames of collaboration in 2 universities – the Lappeenranta University of Technology and Peter the Great St.Petersburg Polytechnic University. Therefore, the selection of startups was conducted in two countries: Finland and Russia, Helsinki and Saint Petersburg. We do not consider the expansion of geographic boundaries due to the limited financial and working resources.

The main focus of the study is on startups companies. We do not consider huge corporations. Internal politics of large companies implies a high level of security. Therefore, companies do not ready to share their methodic. Small companies, in the opposite, are opened for communication. They are ready to share their practices with the researchers and interested in feedback. Besides, nowadays this type of companies is quite popular. Prominent businessmen notice the favourable conditions for an opening internship in Russia and Finland (GUST, 2015). These companies are supported by the government, growing amount of accelerators providing financial and professional assistance and advantageous legal conditions.

In turn, research scope covers only startups that have already launched their products. There is not the unique definition of a startup. We accept as a startup a small independent company producing an innovative product operating for less than five years. Therefore, firms providing the product for more than 5-7 years are out of our scope.

The case study method allows getting qualitative data and creating a real picture of product management practices in startups. The number of analysing firms is four. Qualitative research requires deep analysis. Therefore, we do not take the bigger number of considering companies due to time and work limits.

2 RESEARCH METHODOLOGY

2.1. Research Process

The type of research, qualitative, influences on research approaches that are using in this study. To reach the objective of this study we combine several research methods: literature review, the Diverse Case Study, data triangulation (website analysis, unstructured interview and questionnaires), framework analysis, Within and Crosscase Analysis. The combination of these methods gets a better understanding of the research area and enables to get qualitative results. All research process is described in Figure 2.

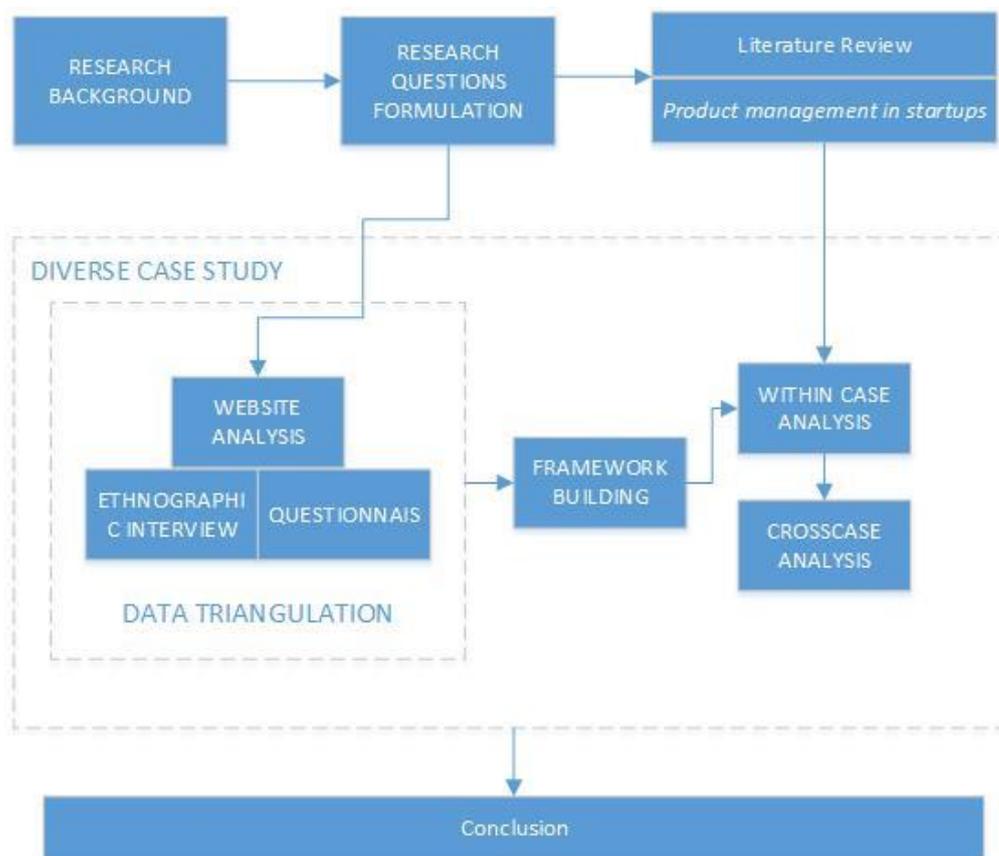


Figure 2. Research Process Overview

The first step is preparing a background for research. The cursory investigation facilitates research questions formulation and research area definition. The next step is aiming to give in-depth knowledge in the research field. The literature study is conducting to prepare a knowledge base for case analysis. The next step is gathering data from different resources: website, unstructured interview, and questionnaire. Then, using coding scheme, all

information is presented in the form of a framework that could be analysed during within and cross-case analysis stages. Finally, key conclusions and findings are drawn.

2.2. Literature Review

The literature review is conducted to find an answer to the first question of research (Q1). To get the complete picture of product management approaches in software companies and particularly in startups, this part is divided into three sections. The first one provides an overview of existing software product management frameworks with a focus on data resources. The second one contains the analysis of PM role in flexible methodologies. And the last one is forced to the understanding of requirements management in software engineering.

The main object of our research is product management practices in software companies, startups in particular. Therefore the research is conducting at the intersection of three main areas: product management, startups, and software industry. The research field of this study is the combination of these searching fields (Figure 3).

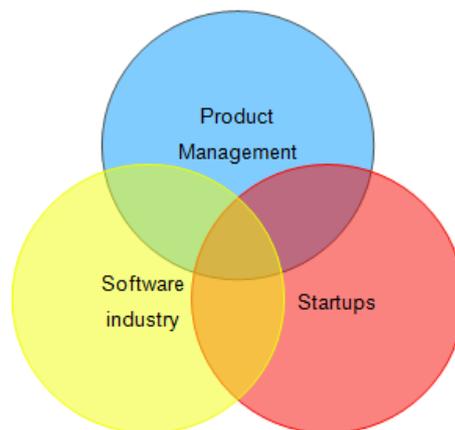


Figure 3. Research Area

Based on established field and research questions we identify the main concepts that could be included in research strings. For this purpose, we included the basic product management concepts, names of modern software methodologies in search request. They are following:

- 1) product software framework
- 2) product owner software
- 3) product methodology software
- 4) product management agile
- 5) product management kanban
- 6) requirement software management
- 7) product startup management
- 8) software product metric development

The searching procedure was conducted in following way: to get qualitative resources for research, several software search databases and journals were explored. There are IEEE Xplore, Springer, ACM Digital Library, Science Direct and Emerland. All databases provide qualitative material for computer science research. Combining keywords by ‘OR operator, we get primary search results (Table 2).

Table 2. Primary Search Results

Resource/ search string	Request 1	Request 2	Request 3	Request 4	Request 5	Request 6	Request 7	Request 8
IEEE Xplore	2184	107	2019	517	36	7367	73	142
ACM Digital Library	170 777	146128	223706	139170	138609	206339	138808	218224
Science direct	152783	31570	179709	6969	1788	213050	29404	40966
Emerald	21384	12037	30646	4575	895	42795	1608	6623
Springer	207501	44690	242729	14623	2751	281264	11320	66937

The selection process starts with the definition of time limits. The research topic is relatively new. Therefore, the data of publication has to be after 2000 inclusively. Also, all articles have to be defined in accordance with the accessibility of full-text and peer review. Moreover, to make the result more narrow we use ‘AND’ operator between keywords and conduct searching process only in the abstract. The searching results are illustrated in Table 3. The selection of material was based on relevance and title/abstract analysis. Next, results were transferred to Mendeley system for future analysis based on exploring full-texts of the identified papers.

Table 3. Search Results Using Extension Criteria

Resource/ search string	Request 1	Request 2	Request 3	Request 4	Request 5	Request 6	Request 7	Request 8
IEEE Xplore	1194	66	1035	169	8	2002	15	67
ACM Digital Library	576	36	450	72	3	1206	13	192
Science direct	522	33	618	108	14	1079	75	123
Emerald	84	6	550	58	3	217	2	6
Springer	207501	44690	242729	14623	2751	281264	11320	66937

2.3. Diverse Case Study

The literature observation shows that there are not broad researchers investigating product management processes in startups. Therefore, we start from qualitative research exploring the particular practices in companies to formulate the hypothesis that could be proven by quantitative research in the future. This approach allows conducting the deep investigation.

Seawright et al. (2008) defines five main types for conducting case studies. There are typical, diverse, extreme, deviant and influential case studies. Taking into account the delimitations of the study and aiming to investigate different approaches in data-driven decision management in startups we set the sight on a diverse case study. Typical, deviant and influential cases are not suited to the purpose of study because they serve to explore or confirm the theory of hypothesis. Contrary to extreme case study comparing although critical instances diverse case study intends to cover the fullest range of different cases. This format of study provides a comprehensive view of the product management in organisations.

Case selection

The searching process starts from the definition of characteristics to potential companies. First of all, based on delimitations of the study the geographical area is defined. The searching process is conducted in two countries - Russia and Finland. Secondly, to get a more complex result in consideration, accepted companies represent different sectors of the economy (B2B and B2C sectors) targeting both domestic and international markets. Due to the aim of the study, the most important factor is the type of company. The potential firm has to produce the innovative product in the software industry. Companies from one country also should have different operation history - be relatively young or maturity. However, the requirement of having working and launching product is mandatory due to the fact of having product management practices in the company. All selection characteristics are listed in Table 4.

Table 4. Case Selection Characteristics

factor	selection
type of company	startup
geographical location	Russia and Finland
industry	software industry
sectors	B2B and B2C
the level of maturity	launching on the market product

After determination characteristics to companies, we define the resource for searching. In Saint Petersburg, the searching process is concentrated on companies from business incubators. This consociation creates conditions and provides infrastructure for startup's growth and development. In Finland, the selection is conducted through "Finnish Software Industry and Entrepreneurship Association" and different business incubators as well. After the analysis of members of these associations, the number of suitable companies is delineated. We send invitations to collaboration via e-mail with a description of research and explanation why we are interested to cooperate exactly with this company in particular. The reason for that is the fact that the personalization of letters increases the possibility of responding. The letters are sent to more than in 50 companies. The negotiating process is conducted with companies who were replied.

Data collection

To get the comprehensive picture to product management in the company the data collection process is designed as methodological triangulation. According to the definition data (source) triangulation requires combination more than one source of information or gathering the same data at different times (Runeson, Host, Rainer, & Regnell, 2012).

Following described approach, following data collection techniques were used: website analysis, ethnographic interviews and questionnaires. As an easily accessible artifact, the corporative website provides relevant information concerning pricing strategy, partners, clients, history of the company. This data is valuable for research and is also used for planning next level of data collection. We do not include a company's documentation into data scope because companies do not ready to share their inside documentation due to confidentiality.

Questions for interview and questionnaire were designed based on background analysis. Interviews were conducted primarily with the person who is responsible for product management in the company. All sessions were recorded aiming not to lose important information. Moreover, to perform successful product policy product manager has continually interacted with presenters of other departments. Therefore, to prove information, getting from the interview, and get new details the several questionnaires were sent to a representative of other departments in the company. The interview and

questionnaire design process are described in details in following parts. The data collections process is illustrated in Table 5.

Table 5. Data Collection Types and Resources

type		A	B	C	D
web-site		+	+	+	+
interviewee		CEO	Product Owner	CTO	CEO
questionnaire	development	+	+	+	+
	CEO	-	-	+	-
	sales	+	+	+	+
	support	+	+	+	+

Data analysis

To get a qualitative result from gathering data we follow the pattern suggested by Paré (2004). The analysis consists of three steps (Figure 4). Preliminary Data Analysis gives the common description of analysed companies. Within-Case Analysis presents the detailed overview of product management practices in each case. Finally, the Cross-Case Analysis reveals the differences and similarities among companies.

Deciding on case study technique, we take into account research questions, time limits and financial issues. Designing qualitative data analysis, we based on theoretical approaches suggested by Lacey & Luff (2007). They consider two key techniques: grounded theory and framework analysis. The first methodology offers a good scheme for data conceptualization by inductive method. However, the primary distinction between grounded theory and other forms of qualitative analysis is the logical finalisation of results in the form of theoretical conception. Due to the limited amount of considering cases and the goal of study we prefer the framework analysis. As a grounded theory this methodology is inductive, but it provides a visible transparent picture on whole analysis process. The framework analysis consists of five following steps (Lacey & Luff, 2007):

familiarisation, identifying a thematic framework, indexing, charting, mapping and interpretation.

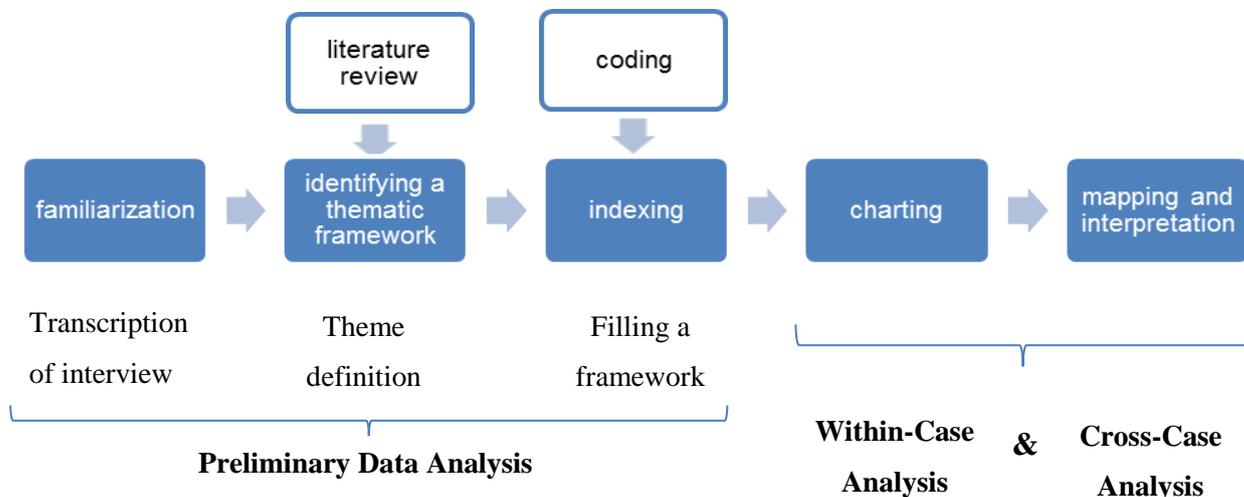


Figure 4. Data Analysis Techniques in Research

The first step, familiarisation, includes transcription of the interview. This step was done manually by the interviewer. The second step, identification, implies the creation of the initial framework based on previous step and literature review. Data will fill this framework at the next stage – indexing. The charting includes developing charts by the case or by themes. For interpretation, we combine two approaches to data visualisation, "Within-Case Analysis" and "Cross-Case Analysis". Based on this analysis we define main findings and draw a conclusion.

Besides, the second step of the framework data analysis could be conducted using coding technique or creation of a case study database. Applying the coding scheme allows organise and discern the essential information for future analysis. Paré (2004) calls this technique as “key data management tool for researchers”. In turn, developing a study database is mostly suitable for quantitative study due to present evidence and interpretation individually. Therefore, we opted for the coding approach. The coding phase is done manually by the interviewer.

2.4. Ethnographic Interview

For this study several types of interviews were accepted into consideration - structured interview, semi-structured interview and unstructured interview (Runeson et al., 2012).

Compared all advantages and disadvantages we choose the unstructured approach to interview. The main reason for that is the conformity to the primary goal of this research is to define the current practices of SPM in startups and to identify main resources required to PM for making decisions. Ethnographic interview as a variety of unstructured interviews allows thoroughly investigate the research topic and gives “unique insight” on research area. Applying to the current case, the main benefit of this choice is an opportunity to get in-depth information about the company, product management’s decisions and their effect on the company. Moreover, in combination with other data collection methods, it brings the highest value for information system research. The interviewer can instantly apply knowledge from personal observation or based on his intuition to get additional information about the topic in comparison with other traditional methods of gathering data such as a questionnaire or structured interview (Brown, 2014; DiCicco-Bloom & Crabtree, 2006)

Conducting this type of interview requires a deep understanding of research area. Therefore, based on literature review the list of indicative questions was fixed and structured in following way. The questionnaire consists of six parts. The first one contains general information about the company: name of the company, product, web address, the size of company, name and position of the presenter, e-mail and phone number. The second part consists of questions providing an overview of the company: history, hierarchy, methodologies and tools that used in the company. The third part provides an overview of PM procedures to draw a frame for product manager’s activities- what covered in the company. All next parts are directly connected with SPM practices in the company and contain questions about next areas: Marketing Analysis, Software Product Strategy, Resource Product Planning, and Pricing. All questions for interview are in Appendix 1.

Obviously, all companies have different products and approaches to business. Based on the web-site analysis some personalised questions were charted to get an answer in the case of positive conversation direction. Moreover, it is worth nothing that in an unstructured interview all questions are open-ended and their order is controlled by the interviewer. The interview sessions characteristics are presented in Table 6.

Table 6. The Interview Sessions Characteristics

COMPANY	LOCATION	RESPONDENT	DURATION, MIN	LANGUAGE	TYPE
A	Saint- Petersburg, Russia	CEO	45	Russian	face-to-face meeting
B	Helsinki, Finland	Product Owner	50	English	conference connection
C	Saint- Petersburg, Russia	CEO	50	Russian	conference connection
D	Helsinki, Finland	CTO	40	English	face-to-face meeting

2.5. Questionnaire

The purpose of the questionnaire is to gather more reliable information using different sources. Analysing the interactions of PM in literature, we define the presenters of various departments that have the vital role in managing product. There are sales, support, marketing and development. However, in startups, the marketing usually is not clear presented, or company is used to take research from business-analytic companies. Therefore, questionnaires are designed for following departments: sales, support and development. Due to the fact that in one company one interviewer was from development department, we created one additional questionnaire for product manager in that company.

For a more comfortable way to conduct it, we used Google form service. That allows build questionnaire, get and analyse the results just sending the link to respondents. Most questions are in a close form to facilitate analysis. Moreover, it is worth to mention that questionnaires were translated into Russian before sending it to Russian companies with saving original meaning.

The questionnaire is variable for each department; however, it has three common questions. The first one provides data about areas of responsibility in accordance with the SPM Body of Knowledge from the International Software Product Management Association (Ih. Kittlaus et al., 2016) to define the level of effect on a product. The second one facilitates to define the metrics influencing on business performance (Paulen & Finken, 2009). The third one contributes to the identification of metrics using in requirement's analysis (Ebert, 2005). All questionnaires for development, sales and support are in Appendix 2, 3 and 4 respectively.

3 LITERATURE REVIEW

This part of research contributes to understanding the areas of PM responsibility in traditional approaches, the role of PM in modern methodologies and requirements management as PM activity. The main finding of this part is obtaining a better understanding of the differences between their responsibility.

3.1. Traditional Approaches to Product Management

The PM role exists more than 70 years (Gorchels, 2000). The responsibilities of this position are changing over the years however the essence of this role is constant. In addition to time, the product management concept is influenced by industry, the size of the company and national specificities. Therefore, there are several points of view on PM activities and responsibilities.

The Product Manager's Framework is developed by Pragmatic Marketing (1993). It illustrates main areas of Product Management and identifies the three key roles within this broad discipline. There are director of the product strategy, product owner and product marketer. Together they present product management triad. Authors emphasize that this model is applicable only for market-driving companies. These firms are focused on the satisfaction of customer's needs rather than searching clients for an existing solution. The Pragmatic Marketing Framework poses thirty-seven essential activities required for creating and supporting a new product through the whole life cycle. All activities are categorized into seven groups (market, focus, business, planning, programs, readiness, and support). At the same time, it is worth noting that, that this framework is actively used and implemented in more than 100 companies (Pragmatic Marketing, 2017).

Inspired by the previously described framework (Kittlaus & Clough, 2009) developed their own model. It illustrates the major functions of product management with the aim to elaborate or to orchestrate. In general, there are eight main areas of responsibilities: market analysis, product analysis, product strategy, product planning, development, marketing, sales and distribution, support and services. Product analysis and market analysis implement qualitative and quantitative resources for decision making of product manager. They provide data only at the product level in comparison with other areas, which are often performed at the corporate level. Another two functions - product strategy and product

planning - include core tasks of product managements and provide main deliverables. The rest functions - development, marketing, sales and distribution, support and services - usually are not outright connected with product manager's activities, but have an incredible impact on the product, therefore, should be orchestrated by him/her.

Another theory of software configuration management is developed by (Kilpi, 1998). The model is divided into four main areas as the delivery, the marketing, the production and the development. The first one is responsible for activity connected with the package of the product. The marketing is aiming to promote the product and to gather information about customers and competitors for next analysis. The production consists of product support and information about product and distribution. The last area, development, is responsible for planning and control of the release schedule. There are also defined six main processes: the release planning, the release project, the software production, the product support, the marketing & sales and the customer delivery. The collaboration of these areas and activities is aiming to satisfy changing customer needs. It also facilitates the success of the product and company.

The framework described in the article (Maglyas et al., 2013) provides an empirical investigation of software PM role. This research illustrates how the roles can be defined within the separated product management department. Characterized by properties and dimensions PM role are defined into four categories: expert, strategist, leader and problem solver. The first one could be described as a beginner in product management, who has a low level of influence on a product according to dimensions. A strategist is a person who has a real impact on strategic and tactical planning. In distinction from the strategist the leader has a higher level of authority and wider access to resources. In turn, the last one, problem solver, concentrates his responsibility in negotiating. He has a high level of authority.

Another product management reference framework is developed by van de Weerd et al. (2006). It illustrates the key process areas, stakeholders and relations between them. These process areas are portfolio management, requirements management, product roadmapping and release planning. According to framework all stakeholders are divided into two groups: internal and external. In the first one, there are Company Board, Research and Innovations, Service, Development, Support, Sales and Marketing departments. Among

external stakeholders there are defined: the market, the partners and customers. According to this framework internal stakeholders participate in operational execution and decision making, whereas external stakeholders can just make an insignificant effort.

Based on the worldwide standard from Association of International Product Marketing and Management, consulting agency the “280 group” created his own SPM framework (Lawley, 2012). This framework is built on the basis of the product lifecycle. It is aimed to be suitable for any development methodology (Agile, Waterfall, Hybrid). Therefore, there are seven phases of flexible product development: conceive, plan, develop, qualify, launch, maximize and retire. First one includes gathering requirements and ideas from different resources - inside and outside of the company. Within the planning stage, all requirements are prioritized and fixed in Backlog. Then, they will be developed during next stages. After completed development stage product has a testing procedure. If it is completed successfully it could be launched. In the next stages - maximize and retiring – PM does not participate directly. He or she is replaced by product marketer to increase demand of the product for achieving maximum success. The difference between PM and product marketer lies in the area of responsibilities. The first one has to ensure that the right product with all his features is developed and delivered to customers. While product marketer serves as a part of the sales department. He or she ensures good selling indicators by positioning of the product and establishing pricing and sales policies.

To sum up, all described frameworks have different points of view on SPM organization. There are different areas of responsibility, a different division of PM roles and different identified stakeholders. However, the main goal of PM is unified for all – to satisfy the changing customer’s needs. Table 7 displays the comparison of SPM frameworks.

Table 7. Framework Comparison

YEAR	AUTHORS	TARGETING COMPANIES	AREAS OF RESPONSIBILITY OF PM	KEY STAKEHOLDERS	NUMBER S OF IMPLEMENTATION	COMPATIBILITY WITH MODERN METHODOLOGIES	PRODUCT MANAGER'S DIVISION
1993	Pragmatic Marketing	market-driven companies	37 activities grouped into the market, focus, business, planning,		>100	Agile	director of the product strategy,

			programs, readiness and support.				product owner and product marketer
1997	Kilpi	-	delivery, marketing, production and development	customer, marketing&sales, product support, development.	no information	-	-
2006	van de Weerd	Small and midsize enterprises	portfolio management, requirements management, product roadmapping and release planning	INTERNAL: Company Board, Research and Innovations, Service, Development, Support, Sales and Marketing; EXTERNAL: market, partners and customers	no information	-	-
2009	Kittlaus and Clough		market analysis, product analysis, product strategy, product planning, development, marketing, sales and distribution, support and services	Marketing, Sales, Support, Services, and Development, market Researchers, customers, partners...	no information	-	-
2012	280 group	flexible	instead of main activities authors defines main deliverables of PM: Business Case, Market Needs/Requirements, Product Description, Market Strategy, Beta Program, Launch Plan, Marketing Plan, End of Life Plan.	other departments are mentioned, but there are not clearly defined.	high amount including huge companies as SAP, HP, Nokia, Adobe, Cisco...	Agile, Waterfall, Hybrid	product manager and product marketer

Analysis of PM frameworks shows the different approaches to product management over two decades. The core of PM activities is the same – PM is responsible for a product portfolio, a product strategy, a product planning, requirements and a product roadmapping. By default, all frameworks are focused on market driven companies. The distinguish lies in the way of grouping these abilities and the level of framework specification. Also, in a

framework designed for huge enterprises we can notice the distribution of PM role between several roles as in frameworks developed by Pragmatic Marketing or by 280 group. From my point of view, in comparison with other methodologies the theory developed by Kittlaus and Clough and by Pragmatic Marketing is the fullest in a questions of allocated activities. . In turn, the framework created by van de Weerd shows the interactions of PM most extensively.

3.2. Product Management Practices in Startups

The software development process is transforming over the years. To get more competitive and efficient development process, more and more software companies transfer from waterfall model of development to flexible methodologies. New innovative startups companies actively support this tendency. In the meantime, the product management practices are transforming caused by the transformation of the development model. Depending on methodologies the role of product manager is called different. There are the project manager (Shastri, Hoda, & Amor, 2016), product owner (Gupta & Manikreddy, 2015), scrum master or customer success manager.

To understand the difference between PM roles we need refer to main principals of methodologies. There are two main philosophies to software development - agile and lean. The lean approach implies following next principals: optimization, avoidance customer's and knowledge waste, improve quality, continuous learning process, fast delivery, everyone's involvement, continuous improvement (Poppendieck & Cusumano, 2012). As an agile methodology lean is built based on waterfall model (Stoica, Ghilic-Micu, Mircea, & Uscatu, 2016). In turn, agile development lifecycle presents vicious continuously repeated actions: requirements analysis, release planning, design and development, testing, implementation and release. Also, the Agile concept is presented by the range of different methodologies such as Scrum, Kanban, Scrumban, XP methodologies while lean approach includes Kanban and Kaizen (Stoica et al., 2016). The major purpose of lean development is to fully satisfy customer's needs during the development process (Fagerholm, Guinea, Mäenpää, & Münch, 2014). The main principals include next ideas: the whole optimization, building quality, avoidance of waste, quick delivery, continuous improvement, the involvement of everyone (Poppendieck & Cusumano, 2012). The statistics of using different methodologies are shown in Figure 5.

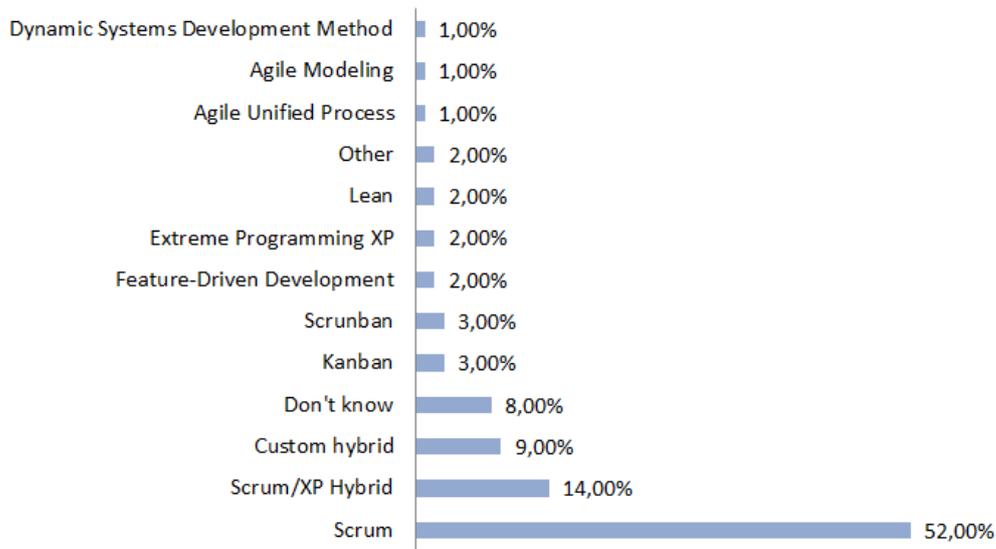


Figure 5. Statistics of Using Different Methodologies in Software Development (Sverrisdottir, Ingason, & Jonasson, 2014; VersionOne, 2011).

Scrum is the most popular methodology from agile methods (Sverrisdottir et al., 2014; VersionOne, 2011). Concerning the main principals of the scrum, all decisions have to be data-driven, based on knowledge and experience. Another major concept of scrum is the principal of self-control of team members (Moe, Dingsøy, & Øyvind, 2009). It seems that the autonomy of team members does not match to product management concepts. However, there are a couple of roles maintaining the leadership on different levels: Product Owner (PO), Team Member and Scrum Master. The substitute of PM in the scrum is the Product Owner (Gupta & Manikreddy, 2015). He is responsible for insurance of financial issue during lifecycle, requirements management and project goals (Sverrisdottir et al., 2014). The last one could be compared with PM who manages and controls people and the project. However, the duties of Scrum Master are slightly different. He is responsible for teaching and controlling the observance of Scrum principals by team members (Mahnic & Drnovscek, 2005).

All product requirements are stored in the backlog. The responsibility of PO at the pre-iteration stage is to deliver expectations from the business side into user stories for further estimation by team members. The checklist preparing to this meeting by PO creates a background for managing risks, scope, interactions and decisions (Gallardo-Valencia & Sim, 2009). Features accepted for development goes to the sprint backlog (Scheerer, Bick,

Hildenbrand, & Heinzl, 2015). One of the main responsibilities of PO is prioritization of features. Due to the frequent releases, this process is steadily continued (Kalliney, 2009). Besides, prioritization of requirements is an aspect that directly affected on product quality. It's an important multidimensional task considering the competitive advantage, long-term customer satisfaction, lean time, maintenance cost, marketing perspective, penalty, risk, customer value (Martini & Bosch, 2015). At the intra-iteration session, PO also has to closely interact with testers because based on data from PO they need to present use cases in the form of test cases that provide acceptance criteria for programmer's code (Figure 6). It is worth to mention that during the development process PO has to keep his eyes on the pace of development processes.

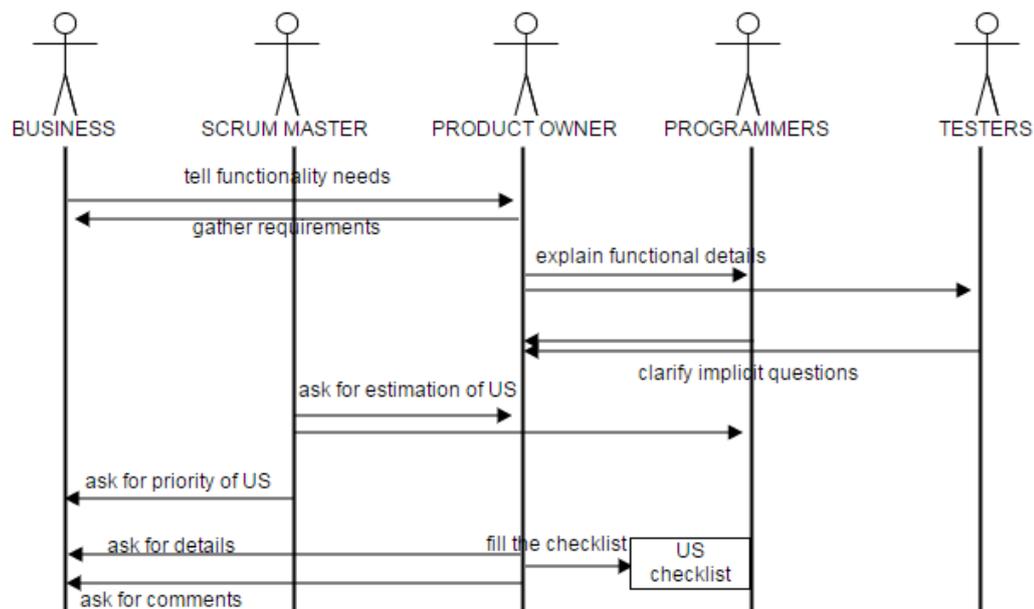


Figure 6. Requirement's Flow at Pre-iteration Stage (Gallardo-Valencia & Sim, 2009)

Extreme Programming (XP) is applying for the small and medium team in the condition of continuously changing requirements (*Agile Processes in Software Engineering and Extreme Programming*, 2013). The main principals of it imply common working space, cross-functional team, user stories, coding in a pair, continuous integration, refactoring, test-driven development, the on-site customer (Koutonen & Leppänen, 2013). Among the main roles could be defined developer, tester, customer, coach, managers (Ghani, Izzaty, & Firdaus, 2013). The customer is the main person who is responsible for managing a product. Coach in XP also takes part in building product but his duties are mostly

concentrated in the quality insurance area. He is responsible for control of product quality during release as well as for code quality. Concerning other participants, manager tracks the process and manages the team, the programmer is responsible for coding while testers check the code quality.

In XP customer role is mostly closer to the role of Product Manager. He or she is responsible for writing story cards or user stories and prioritization them depending on importance (Williams, 2003). Next, customer, XP manager, programmer and security master have the “Planning game” session. They define how much user stories go into production and form multiple stories. It is worth noting that during the development process, customer has to continuously integrate with other members and especially with developers to implement user stories into code properly. Therefore, the customer should have enough knowledge in development area to be able to explain implicit questions to developers. User stories are also used by testers to check the quality of the product before the release. As it was emphasized before, the whole process is built on continuously integration the team members, therefore, during releases customer also needs to evaluate the project continuously communicating with other participants (Ghani et al., 2013). One of the main tracking metric in XP is velocity. It is used for estimating the amount of work that is done in one release. To improve the accuracy of the assessment customer can organize the repeated planning game to get corrected estimation of user stories from developers.

As previously described methodologies Feature Driven Development (FDD) also refers to agile philosophy. This methodology is based on the object-oriented approach to software development. Feature is the central object that is presented in the next form: <action><result><object> (Mahdavi-Hezave & Ramsin, 2015). FDD lifecycle starts from the creation of “overall model”. The next step is building a set of features (feature list) that are also grouped by subject area (Chowdhury & Huda, 2011). Then the whole process is planned, designed and built by feature (Siddiqui & Alam, 2012). There are several roles taking participation in FDD: Project Manager, Development Manager, Chief Architect, Chief Programmer, Domain Expert, Class Owner. The responsibility for SPM could be divided between PM, Class Owner and Domain Experts. The first one controls the whole project, budget, resources and reports the progress. The second one, Class Owner, assists to

Chief Programmer by designing, coding, testing and documenting the requirements. The last one, Domain Expert, presents the knowledge base for feature definition.

The principles of Kanban methodology are based on interaction through controlling tasks, measurement of workflow and continuous improvement activities. This methodology implies continuous workflow and lack of certain time limits of iterations (Corona & Pani, 2013). The main tool for tracking product development is Kanban board. It contains Kanban cards that called tickets. In turn, they present the pieces of work chosen from the backlog for software development (Ikonen, Pirinen, Fagerholm, Kettunen, & Abrahamsson, 2011). A person, who carries out of PM role, needs to take care about the board and prepare the ticket estimation and prioritization in advance. These cards are moving from left column to right at Kanban board with the completion. As a part of Lean philosophy, Kanban does not imply the role of PM, however, this responsibility takes an entrepreneur leading a startup business or such roles as a chief engineer, program manager or product champion (Poppendieck & Cusumano, 2012). Besides, there is not a clear division of responsibility in Kanban. For instance, the leader of a startup is responsible for whole product and project. He has to take into the consideration and financial issues, and market positioning, and implicit control under the team.

In the real world it is almost impossible to meet a company strictly following a poor methodology. The majority of companies implement them in different variations and combinations. Therefore, the integration of scrum and kanban is considered as a separate methodology. Scrumban allows meeting product requirements and client’s need without following the strict rules imposed by project methodology (Stoica et al., 2016). Scrumban has the same visualization tool as Kanban. The main difference of this board is that it has additional columns for the division of tasks from the backlog (Corona & Pani, 2013). In turn, from scrum this methodology takes the practice of daily traction meetings. As a metrics it uses the average lead time, velocity is optional. The SPM practices in this methodology are similar to Kanban. The whole comparison of the product manager role is presented in Table 8.

Table 8. Comparison Product Management Practices in Flexible Methodologies

	XP	SCRUM	KANBAN	SCRUMBAN
metric for	velocity	speed (burn down	deadline/ lead time	average time,

process improvement		chart)		sometimes velocity
storage for requirements	user stories	sprint backlog shared by the team	kanban board	kanban board with the division of work type
concept of visualisation	multiple stories	new Scrum board for each sprint	persistent	depends on iteration decision
substitute of Product Manager	customer	product owner	optional: leader of entrepreneurship/ chief engineer/ program manager/ product champion	optional: leader of entrepreneurship/ chief engineer/ program manager/ product champion
requirement's prioritization	by the customer before the planning game	established in backlog for each sprint	optional	recommended
estimation	prescribed	prescribed	optional	recommended
family	Agile	Agile	Lean	Agile & Lean

Comparing roles of Product Manager in the traditional way and in flexible methodologies we can conclude that they are similar. Both of them follow the same goal – create the demanded product. The main distinction between them is priorities. The main focus of Product Manager is on interaction with customer and stakeholders. While in flexible methodologies the representative of PM is mostly responsible for creation and delivery of user stories and explanation of the ambiguity to developers. Thus, in traditional frameworks PM has a bigger picture of market because he tracks the market, creates and maintains the product roadmap. In Agile, PO manages requirements, controls backlog, attends scrum meeting and document functionality. Also, it is worth to mention that the level of influence on product of PM in flexible methodologies is lower than in traditional PM where main decisions about product are made directly by PM.

3.3. Requirement Management in Software Product Planning

Requirements stage has a significant meaning and effort on development processes. The study conducted by Salty (2007) reveals that the biggest amount of defects is made at the requirements stage. The default rate achieves almost 50% that exceed the same metric at testing and construction phases in four times and twelve times correspondingly. In turn, the financial cost of defect fixing is not cheap and increases sharply from the first to the last stage of the development process (Jaimunk & Sureephong, 2015). Therefore, the right

approach to gathering and delivering requirements processes allows save money, increase the effectiveness of processes and improve the quality of the product. However, requirements should not be the main driver of the planning process. PM has also to rely on budget and resources (Ebert, Dumke, Bundschuh, & Schmietendorf, 2005).

The science, managing the product requirements, is called requirements engineering. Its' purpose is to maximize the value of given investments by managing requirement in release planning process. The value of requirements could be considered from a different perspective as a business, product or project perspective. The first one address to the product from a sales point of view, the second one - from customer and market while the last one – from a project point of view considering time, resources and workload (Barney, Aurum, & Wohlin, 2008). The main metric for a product manager is user satisfaction. It shows “did user needs meet at the developed system or not?”. Therefore, the main task for a product manager is to define what metrics are valuable for the customer and what are not (Kakar, 2015). The right requirements planning activities allows to developers create right product in right time to satisfy customer needs (Voola & Vinaya Babu, 2017).

For Requirement Prioritization (RP) product manager has to take into account a lot of factors that are important for different stakeholders such as user, developers, managers and partners. Aspects next to main factors are importance, penalty, cost, time, risks, volatility and others such us financial, strategic, competitiveness benefits. The volatility is a special term for changing requirements during the development process (Jaimunk & Surephong, 2015). Thus, to be successful modern software company has to juggle the increasing amount of product requirements. One of the solutions facilitating the success release is the requirements prioritization. There are several approaches to requirements estimation based on setting the different values to requirement aspects.

The ranking is the simplest way for RP. It is based on building a ranking list by attribution to requirements the unique rating from 1 to n (for n requirements). In turn, cumulative voting implies distribution certain amount of points among requirements (100 points). This method allows taking into account the opinions of a lot of stakeholders. However, it also makes the process more complicated in conditions of large amount or requirements (Santos, Albuquerque, & Pinheiro, 2016). Moreover, some smart stakeholders can make the significant influence just giving whole money to favorite requirement (Berander &

Andrews, 2005). The priority groups technique is based on grouping all requirements into 3 groups depending on the level of priority: low, medium, high.

One of the other popular traditional methods in PR is Analytical Hierarchy Process (AHP). It is based on the decision-making process. Pairs of requirements are compared to determine which one has the highest priority (Karlsson, Wohlin, & Regnell, 1998). Another RP technique is the value based approach. It implies the estimation of each requirement based on certain metrics (category). Then each category is assigned by weight of importance. As a result, all requirements could be presented in a list based on the estimation of each criterion and its' weight (Kakar, 2015). These approaches refer to requirements engineer's technique. They are an easy way to estimation but it is inconvenient in conditions of always changing requirements. It leads to re-evaluate requirements when adding new.

Quality Assurance literature also offers several approaches to RP. There are an importance grid, a Direct Classification method, Dual Questioning and Kano Survey methods. The Direct Classification method is based on the classification of requirements into three groups: Basic, Performance and Excitement. The Grid approach is similar to Direct Classification Model. In addition, users prioritize requirements using beta coefficients to get gradation. The Kano Survey method is considered as one of the most effective among enumerated (Witell & Löfgren, 2007). The task of respondents is to give the estimation to current requirements from two opposite points of view: the importance of feature if it is presented and the importance of feature if it is not presented. The difference of Dual Questioning method from others lies in taking into the consideration market factors for developing a market-driven product (Kakar, 2015).

To sum up, all methods have their pros and cons. To understand which one is more suitable product manager has to think about a number of stakeholders, the amount of existing, changing and getting requirements. Also, he or she needs to be ready to experiments. Unlike a theory, practice gives a better understanding of RP techniques.

4 CASE STUDY ANALYSIS

4.1. Preliminary Data Analysis

For comparable analysis we chose companies with pretty the same size of workers, departments, not long operation history from both sides: 2 from Russia and 2 from Finland (Table 9). All companies are from software industries and working in B2B or B2B and B2C sector at the same time. Getting the positive feedback from the company, we start from the analysis of the website. Then, after conducting the interviews and questionnaires, answers were labeled and categorized for future analysis. Due to the fact that interview was structured, all parts were easily grouped consolidated under main topics of product management. Below there is short characteristic of analyzed companies. Full framework can be found in attachments (Appendix 5).

Table 9. Characteristics of Analyzed Companies

CASE	A	B	C	D
Product	software	application software+ web service	application software	web service
Sector	B2B	B2B & B2C	B2B	B2C & B2B
Country	Russia	Russia	Finland	Finland
Number of employees	15	8	8	22
Pricing Strategy	MLC month, quarter, half of year, year	% from transaction OR fixed price	% from transaction	flexible floating percentage
Number of departments	4	3	3	5
Departments	sales, marketing: content manager, development and support (+designer, counter)	sales, support, development	software development, business development: marketing and sales	sales, customer support, marketing (digital & traditional), KAM, development, top level.

4.2. Within-Case Analysis

Case A: Firm A is a mono product software company that focused on the domestic Russian market. The product is specific. It highly depends on government regulation. The firm is relatively new and starts to take finance for their services since August of 2016. The team consists of 15 workers in total. It is leading by co-founder moonlighting as a CEO and PO. There are four departments: sales, marketing: content manager, development and support. The management style could be described as persuasive. Whole decisions and strategic direction of the company are made by CEO. As a Product Owner CEO carries out duties in next areas: strategy, partner's negotiations, release planning. The firm follows the agile methodology in development processes. The one sprint lasts 2 weeks. The development process is controlled by the team lead and planned using Jira tool. Tasks are managing via Trello tool.

To define possible features the gathering requirements process is organized and managing by departments in the following way. All requirements are gathering in backlog stored in Google Doc. There are three main resources for requirements: clients, strategic goals, and integration tasks. Strategic goals go from roadmap (for 12 months), requirements from clients come through sales and support while integration tasks come from partners and development due to the product specific. There is not any gathering requirement's session. Each department has a person who is responsible for requirements - edition of the list in Google Doc to prevent repetition, misunderstanding or inaccuracy. All requirements are taking into the consideration depending on their priorities. They are estimated tentatively by their department during planning session (once in 2 weeks). Participants of this meeting are the PO, team leader and product designer. Other departments do not bring a big influence on the end product. The tangible effect could be done only by development from a workload point of view. Partners effect on the product in frames of integration tasks Whole process is illustrated in Figure 7.

Owning to the fact that marketing department is in the initial phase and presents just by the content manager, the PO is also responsible for marketing analysis. The main resources for marketing analysis are local and international competitors. Analysis of local competitors is happening non-recurrence depending on competitor's activities. The main resources for

analysis are websites, news or article and hiding client's calls. The company does not conduct cold calls to customers. All information from current clients goes through support.

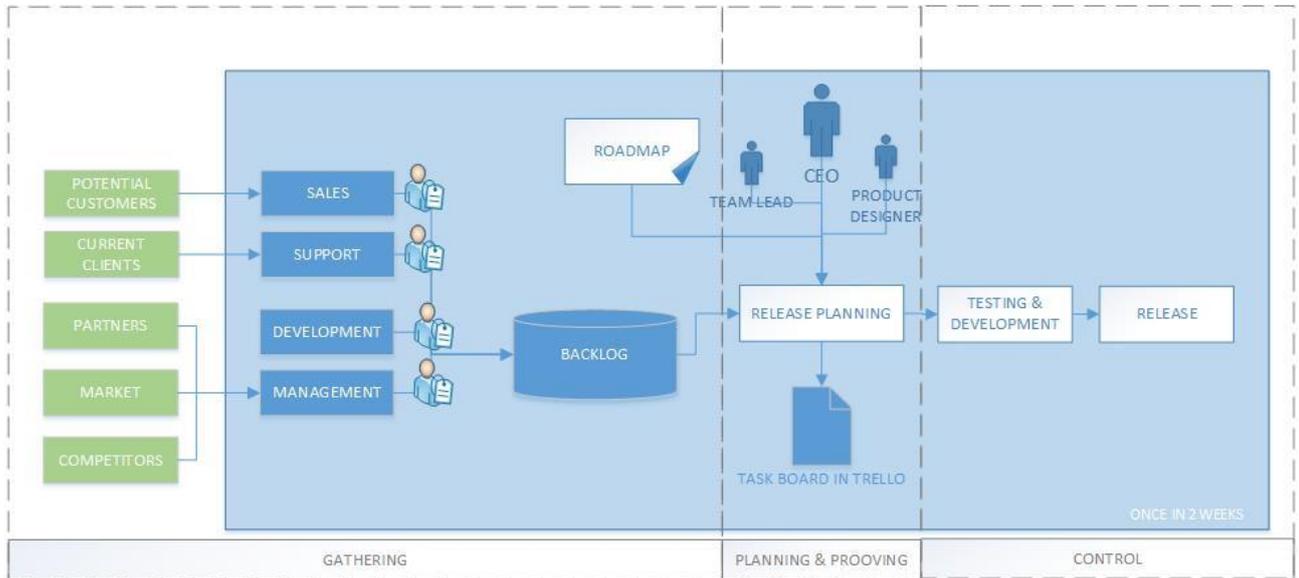


Figure 7. Gathering Requirements Process in Company A

The pricing strategy is based on competitor's comparison. The company seeks to be cheaper than the main competitor and adheres to make pricing policy as crystal as possible. Thus, the price is fixed for all customers but has different variations depending on the duration of the contract - Monthly License Charging (MLC), Quarter License Charging (QLC), Year License Charging (YLC) - and the amount of connected devices. The pricing strategy is defined by PO, who is CEO as well.

The performance of departments is estimated using metrics. Main indicators tracking in sales are a number of sales and conversion rate, in the development - the average velocity (story points) in one sprint, in the support - a time of problem-solving, customer's estimation of support quality and a number of overdue tickets. All departments estimate requirements from a business value from customer's side. In addition, support emphasizes the critical importance in terms of legislation. Also, development marks business value from partner's side, critical importance in terms of legislation and workload.

Case B: Company B is an actively growing startup in the Finnish software industry and one of the key players in their market niche. The firm was founded in 2014 while the product was launched in August of 2016. The firm offers a business service to customers. Other words, it mediates between business and customers. The company provides web

platform and tool for data analysis. Company board consists of nine persons. However, the biggest one is CEO of a company. This fact allows to him be more and less independent in his decisions. The firm has 23 employees consisting of next departments: sales, support, marketing (digital and traditional), key-account management, development, the top level of the company. In a company, there are democracy reigns. However, it is strictly controlled by project manager moonlighting as a PO. The last one is fully responsible for product and carries out duties related to gathering and managing requirements, product and pricing strategy, control of development process.

The development process is built on a combination of Scrum and Kanban methods. The sprint has a strict time limit (2 weeks). This process is controlled by project/ product manager due to the fact that versions have to be necessarily released with declared functionality even by increasing amount of people. Business strategy of the company is building in compliance with the obligations arising from main current business customers. This firm has separated department who is responsible for identifying problems of customer's - Key Account Management (KAM). It gives the company a competitive advantage because the company pays bigger attention to key partners to satisfy their needs.

The main resources for gathering requirements are current customers, key partners, roadmap and backlog (Figure 8). The main channels are other departments: through support company gets requirements from current customers, through KAM - from key partners, through sale - from potential customers. Moreover, a firm has weekly meetings to discuss product strategy with the whole team. It is worth to mention that development has a little influence on a product due to the business model - to satisfy current needs of key customers, moreover, programmers are distance workers. Responsibilities of product owner also include a preparation of three sets of features for development on next sprint. One of them should be approved by CEO and then fully planned and controlled by project/product owner using Kanban board and daily standup meetings. Planning release and task management processes are implemented by using Jira tool.

The creation of pricing strategy is fully on a PO. However, it should be approved by CEO. Currently, the company has flexible floating percentage depending on value bringing by a potential partner that could even not bring a profit. Because the company is focused on conquering of a market to become a leader not on getting profit. Moreover, company sticks

to the strategy of suggestion of cheapest price. Others pricing strategies were considered on a paper without any experiments. However, the company tries out different product packages for service delivery.

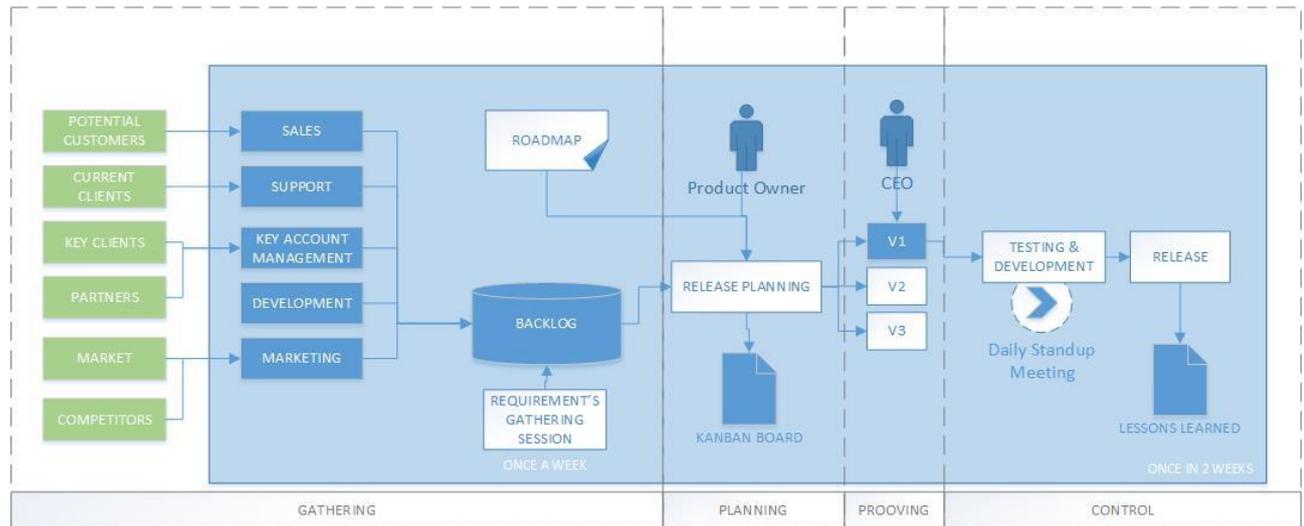


Figure 8. Gathering Requirements Process in Company B

For performance estimation development uses indicators such as velocity, the number of defects, conformity with a plan (functionality), conformity with deadlines (time limit). Support uses the amount of solving the problem, time of problem-solving, customer's estimation of support quality and sales uses the amount of sales and conversion rate to customers. All departments reiterate the importance of requirements from partner's and customer's side. The development also uses requirements metrics illustrating the workload and the critical importance in terms of legislation.

Case C: Company provides services for B2B and B2C sectors. The main service is providing a set of products including web service and a couple of mobile applications (Product Portfolio). However, the company considers it as a single product. It is worth to mention that the product highly depends on government's regulations. The size of the company is not big - it comprises 8 employees that present 3 departments: sales, support and development. The management style in the company is emphasized democracy. The firm was established in 2014 by two co-founders: one of them is responsible for the development process, Chief Technology Officer (CTO) and team lead, while another one carries out business duties Chief Executive Officer (CEO). The analysis on company shows that SPM duties are divided between both partners. One of them is responsible for

business and product strategy, the vision of the firm and targeted market, while another is responsible for product functionality.

The development process is based on applying of the scrum and agile methodologies. The time of sprint is not strictly limited and mostly depends on the complexity of release. It is about 1-2 weeks. The development process is mostly controlled by team lead, but whole processes could be also tracked in Trello. Slack is used as storage for requirements and Microsoft Office 365 for document flow. The main resources for the gathering requirements process are current clients, strategic goals and marketing analysis as well. Each worker has an access to SLACK to add his or client's idea. Then based on requirement's analysis some of them are moved to Trello for workload estimation by developers to setting time limits. So decision concerning what features could be developed is done by CTO of the company. The requirement flow is shown in Figure 9.

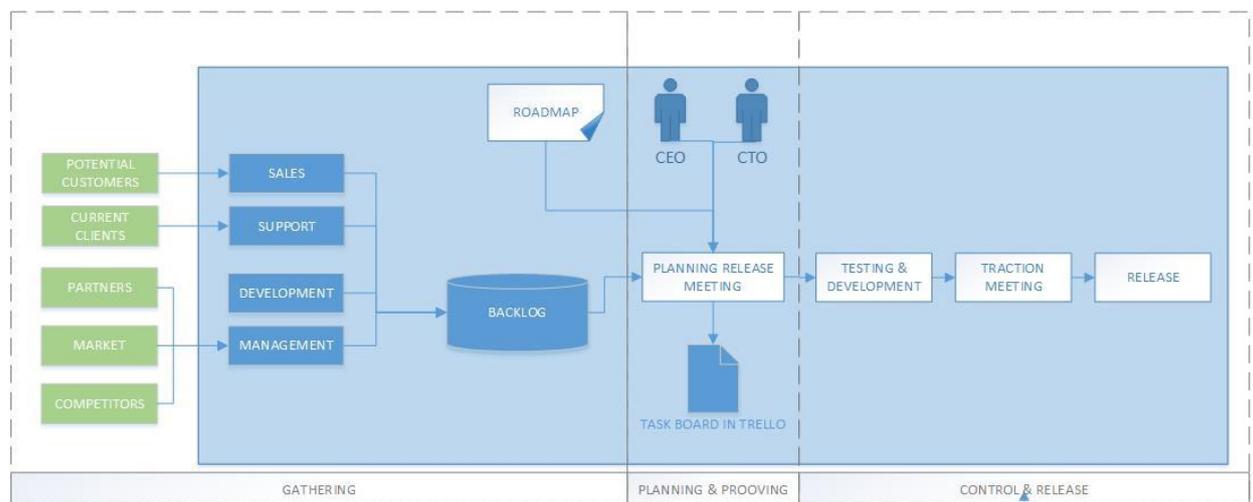


Figure 9. Gathering Requirements Process in Company C

The main marketing resource for competitor's analysis is customers. Due to the specific of market whole information goes from existing customers who refused the offer of a main huge competitor because of the high price. This company sticks to a flexible pricing strategy that depends on each certain customer. So it could be a certain percentage from transaction or fixed price paid by business or customers. Moreover, the company has real experiments with prices. It's worth to mention that this company strives to solve problems using modern technology and innovations not by finance or people. The startup is also actively using the services of accelerators.

Among main indicators estimating the performance the support draws the attention on the time of problem-solving, customer's estimation of support quality, the sales - conversion of customers, the amount of sales and Customer Acquisition, the development – conformity with a plan (functionality) and conformity with deadlines. In turn, the requirements depend on the estimation of business value from customer's side, critical importance in terms of legislation and workload.

Case D: Company D is relatively new on the market. However, it has an own niche at the local Finnish market that allows being focused on the development process. The firm offers the service via software applications for different platforms. The company was founded in 2015 and includes seven employees that present two sides, technical and business. The first one is fully responsible for programming, while the last one is responsible for partner's negotiations, marketing and sales. The management style is a democracy. It builds on equality of each member.

The company follows to scrum and kanban methods of development. The time limit of sprint depends on functionality. In several, it takes a month. Responsibility between technical sides is distributed by platforms. It makes easier the tracking and controlling process. Moreover, all team members are present. They work in common workspace that makes easy the communication process. However, for discussion team additionally uses SLACK.

The responsibility for gathering requirements belongs to each member. All requirements are stored in Google doc. Business side (CEO) offers features for next release and set milestones. However, development can influence on it by workload estimation. Moreover, conflict's points are solved by voting. All features are ranking by each member before the meeting based on own opinion.

The main resources for gathering requirements are current clients, roadmap and partners. Due to the specific of product the feedback from clients goes not through support. For this purpose company runs the group in messenger with 100 random active users. The firm encourages them for commentaries. From partners company gets requirements concerning integration issue. The roadmap consists of long-term oriented plans for 5 years. It is worth to mention that company is aiming to go to international market. Therefore, the analysis of

local competitors are highly important but on the Finnish market is not a priority. The whole process is presented in Figure 10.

The key spending for the company is marketing and salaries. However, due to the small team size and transparency of activities, there is not any KPI affected on a number of salaries. However, for performance estimation company uses some metrics. In development there are a number of defects, conformity with a plan (functionality) and deadlines (time limit). In turn, in sales they are the conversion rate of customers and amount of sales. Also team estimates requirements using workload, risks, business value from customer's side, critical importance in terms of legislation

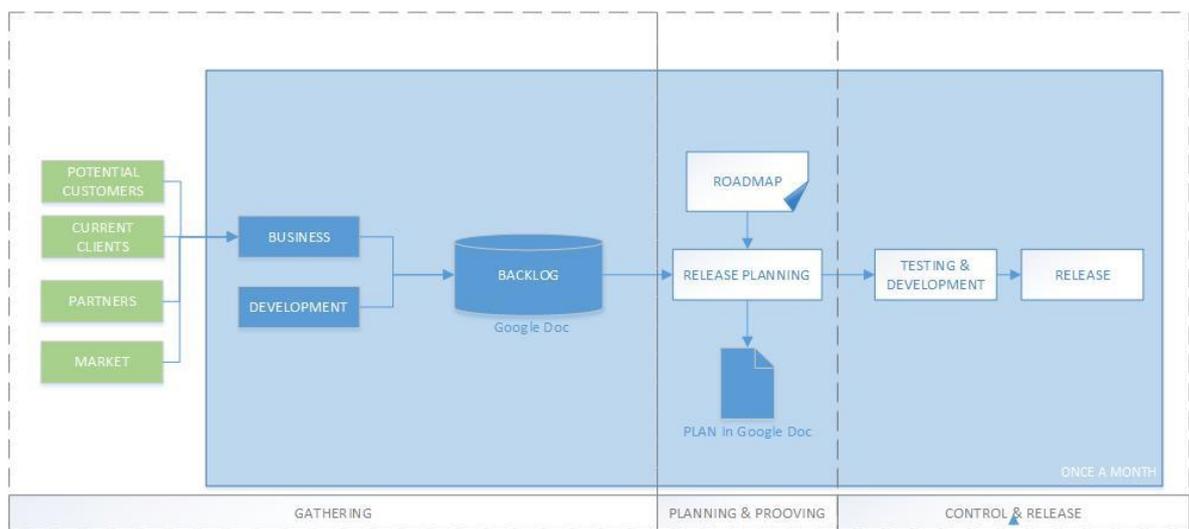


Figure 10. Gathering Requirements Process in Company D

4.3. Cross-Case Analysis

To provide a better understanding of factors influencing on product management in companies the within-case analysis is added by cross-case analysis. The last one provides a deeper understanding of research objects, by comparison, identification of common and unique features, pattern's modeling (Eisenhardt, 1995). A full analysis was conducted using modeling research framework that described major factors of product management (Appendix 5).

The company A is distinguished from other cases by their approach to product management. The function of the product owner is carried out by CEO. Moreover, the level of product dependency from the product is quite high as an in case C. Moreover, in

comparison with the company B this startup does not have a marketing department. It restricts the development pace of company. The process of gathering requirements is quite unique. In each department there is a responsible person for checking quality and relevance of requirements.

In the company B the product management duties fully rest with the PO, who also carries out the function of project manager. The major distinguish from other companies is the existence of special department, KAM, who is focused on support of major clients. Besides, this company is distinguished by the strict time limit of sprint (two weeks) and daily control of team members (daily meetings). This company is also mostly market driven in comparison with others. The business model of this startup is built on the satisfaction of current needs of partners. Moreover, this company has the most improved system of metrics in the company. The effectiveness and productivity of each member directly effect on their salary.

Like the others, the case C is remarkable by the system of responsibility for product development. In this specific case, two persons are responsible for product development – CEO and CTO. They divided their responsibility concerning functional areas. This company has the most flexible pricing strategy and not afraid to conduct experiments. Furthermore, this company is the most actively use the services of the accelerator.

Company D is one of the youngest analyzed companies. This case is notable by full democracy between members as a consequence the fully lack of a person who is responsible for the product. All contentious issues are solved by voting. However this company has the distinguishing approach to getting the user's feedback – team runs the group in messenger for getting feedback from constant users.

Before cross-case analysis of each company separately it is worth to highlight the common features among considered cases. First of all, all analyzed startups use flexible methodologies for development. The interest to a product is supported by frequent releases. In the meantime, all companies take into account the desire of current customers using different tools and channels for getting feedback. The focus on potential customers exists but in different degree. Companies, who are at the beginning at their development (case D), is mostly focused on the satisfaction of current clients. Unfortunately, no one from analyzed companies uses the product management tools in product management activities.

However, Jira is most popular among planning tools, while Trello is used for task manager activities.

Concerning national features of product development, note, Finnish companies pay more attention to customer's needs, rating the satisfaction from the customer, looking for a different approach for getting feedback. Russian companies mostly rely on information from support. They get the information about customer's problems, however, this way does not facilitate to product evolution. Moreover, the business structure of Finnish business influence on product manager as well. The compulsory existence of company board in Finnish companies also effects on the business model of the company because the desires of partners play a significant role in product planning.

In considered cases A, B, C, D all companies are market-driven in varying degrees. While the company D is oriented on the global market to increase the number of users, company D is focused on particular clients. The KAM facilitates to satisfy the needs of key players that lead to increasing profit. However, this approach has and downside. Focus on the market could lead the situation, when the product develops following the wrong branch. As a result, it could miss the development direction of the whole market.

All presented cases have a flexible pricing strategy. It is built on the financial counting and marketing data. However, it is worth to mention that companies too much oriented on their competitors. To create a profitable sustainable product they need to be not afraid of experiments with a price. Meanwhile, the roadmap is the direction of company development. Lack of long term oriented goals facilitates to loss of growing opportunities or it could lead even the death of the company. In this particular study, company A, B and D has a clear picture of direction while company C is not clearly determined their future.

All considered companies present different approaches to Product Management. Case A presents the situation when product management duties is carried out by CEO of company, case B is driven by Product Manager, case C illustrates the situation when responsibilities are shared between CEO and CTO, and case D is an example of company where there is not any particular person who is responsible for product management (Table 10). Each situation has own pros and coins.

Table 10. Product Management Responsibility in Companies A, B, C, D.

	Case A	Case B	Case C	Case D
The role conducting Product Management duties	CEO	Project manager	CEO & CTO	each member

The combination of roles CEO and Product Owner is a good solution for small startups which do not have an opportunity to evolve a lot of people. On the one hand, the product owner does not have a large influence on company strategy. He has to build the product in accordance with it. Therefore, the integration of these roles gives the broad picture of business and product strategy. Also, it gives an opportunity to change the direction of the company. On the other hand, the existence of additional duties does not give an opportunity to fully focus on product management or business activities. However, it is worth to mention that appointment of a person, who is responsible for requirements in one department, simplifies the product management activities. Meantime, the participation of three members (team lead, CEO and UI designer) in release planning meeting facilitates to consideration of different aspects of product development.

The product management organization process in company B is the good illustration of the situation, when product management duties are carried by Project Manager. This obstacle can lead to confusion of development focus in Case B. The Project Manager has to control other workers and to defend the interests of the team, while PO has to think about customer's interests. However, Project Manager always has information about the pace of development. He is able to look at requirements from workload and complexity point of view. It could be considered as a priority in product management decisions.

Case C illustrates the situation when product management responsibility is shared by CEO and CTO. It is a solution to manage product when knowledge about the product are shared between two experts: one is responsible for the business side, while another one - for technical questions. This way is suitable at the early stage of development saving balance between technical and business development of the product. However, it could lead to the

wrong direction of the development process, if technical people start to choose the direction of development.

Case D presents the situation, when all members are equal, that leads to lack of authority in product management questions. It could be explained by youngest of the company. Nevertheless, lack of authority for product management already leads to conflicts in the team. Moreover, voting is not the best solution for selection of the product functionality. The product has to meet customer's needs, not developer's needs. Sooner or later, the team can understand that their product is developing in absolutely wrong direction. Thus, this situation could lead to the dysfunctionality of whole product (Crown, 2002).

4.4. Pattern's modeling of Product Management in Startups

Based on the conducted part of case analysis we identify some common features effected on the SPM practices in companies. No doubts, the best solution is to have a separate person, who is responsible for managing product requirements. However, startups face a lot of challenges during the product development. First of all, they are doing business in conditions of strictly limited resources. Software production does not require a financial spending on the material, but human and intellectual resources are highly valuable and limited (Unterkalmsteiner et al., 2016). To overcome this problem startups clustered or combining different roles. A product manager or other term applying in this methodology for this role is one of the roles who is assigned to another role.

P1: Product Management responsibilities are shared between team members

In conditions of strictly limited resources, the good solution is to deliver this responsibility to another player but they could not be left untended as in a case D. Moreover, analysis shows that planning release activity based on the interaction of technical experts and business leader. The first one provides knowledge about technical characteristics of system and integration issues, while the second one tracks the common direction and customer-valuable features in planning release activities. It can lead to conflicts concerning the functionality of the product. Therefore, it is better when technical and business experts take participation into the discussion, but the final decision has to rest with one business leader.

P1.1: Division product management responsibilities between business and technical experts

To achieve a high level of customer satisfaction flexible methodologies implies the continuous interaction between team members (Bhalerao & Ingle, 2010). The way of communication highly depends on a number of workers, working space, working distance. The analysis shows that due to the small size of the team and common development space all participants can easily communicate with each other to get new information about product and features. Therefore, an unorganized informal communication is used as a channel for exchange information about the product. Moreover, to track the progress and discuss ideas teams use task manager. It also has an electronic whiteboard for controlling the work progress.

P2: Communication through electronic whiteboard

P2.1: High level of informal interactions

The main strategic components of product development are Business Strategy, Product Strategy and Product Roadmap. The first one, Business Strategy, provides business vision, inspirational goal, the motivation for development. It could be described by questions: “What and why?”. Product Strategy provides strengthened long-term oriented plan for product: where and how we are planning to come. In turn, Product Roadmap is a bridge between short-term oriented plans (release planning) and Product Strategy. It consists of 2 parts. The first one provides a short-term oriented plan (12 months), while the second one provides priorities for future development (more than one year). The analysis of considered cases shows that startups have a lack of documentation at a high level. They combine business strategy with product strategy due to the fact, that usually startup is a mono product company. At the same time, some national tendency was noticed – Russian companies are more short-term oriented, they are focused on current priorities and have a vague vision of product in long-term perspective.

P3: Product strategy is combined with Business strategy

As was mention before mixed agile methodology is popular among startups. As the same time, agile software development implies high flexibility and instant respond to customer’s needs. Short iterations in the Agile development process are aimed to maximize business

value for the customer. It is valuable in short-term perspective but creates a negative impact on long-term oriented development (Dinakar, 2009). Therefore, the product could be developed in accordance with current customer's needs, but in the wrong direction of product vision.

P4: Short-term oriented plans are preferable than long-term product strategy

Huge companies due to their size are unwieldy. It takes the time to change the direction of development, follow to modern trends. In this regard, startups are more flexible. They are able to give a quick respond to changing customer needs. This flexibility could be considered as a benefit, but it also can detract company from the main direction.

P5: High level of flexibility in product development

There are two main approaches to pricing strategies: cost-based and value-based (Harmon, Raffo, & Faulk, 2004). The first one is a traditional approach involving the financial orientation on spending. It is highly depending on sales volume prediction. Applying of this method is explained by the desire of business to cover expenses and accomplish the level of profitability. The value-based approach is based on the estimation of product value from a customer point of view. Other words, how much customer is ready to pay for this product. It is worth to mention that all companies use flexible pricing strategy aiming to achieve customers and partners. However, one of the common mistakes among pricing strategy is a pursuit to be the cheapest provider. No doubts, that low price is profitable for customer but it does not guarantee a high volume. The fundamental law of economics that the lower price directly influences on volume of sales is true only for undifferentiated commodities.

P6: Flexible value-based pricing strategy

P6.1 The pricing strategy is driven by lowest possible price among competitors

The main metric of product success in company indicates the main drivers of product development. Sales driven firms are oriented on immediate result. The main goal is to convince the customer to buy a product. Technology-driven approach implies to searching a customer, who is ready to buy an existing innovation. In turn, the market-driven approach is focused on the satisfaction of current customer needs (Rahaman & Muhamad,

2004). It is worth to mention that all presented cases are market-driven due to continuous interactions with the customer and short iterations. Moreover, all companies are aimed to expand the market relegating to second place the business payback.

P7: Market-driven approach in product development

To some up, we can conclude that all features are defined by startup's challenges. There are time, work and financial limits. However, startups seek to overcome it with minimal losses trying to find own solutions.

5 FINDINGS AND DISCUSSIONS

5.1. The Real Role of PM in Startups

The analysis of real companies shows that the PM role in a traditional way does not exist in considered software startup companies at all. Despite the fact that all considered companies utilize different approaches for software product management, during the interview all of them refer to the term of Product Owner. Therefore we can make a suggestion that the role of PM is transforming affected by new trends as flexible development methodologies.

Analyzed companies follow the scrum and scrumban methodology. Thus, we can compare the role of Product Owner in literature with existing cases. Concerning the literature PO is responsible for long term and short term oriented roadmaps. All considered companies have short-term roadmap. However, companies A and C have these documents only for short period. It indicates one of the main problems of startups - short-sightedness. The person, who is responsible for product management in company, has to eliminate this issue as far as possible.

According to the literature the gathering requirement's procedure has to be controlled by PO. Companies A and B have persons who are fully responsible for it. These people also make user stories clear for all team members, aiming to launch desired product. In companies C and D, this process is left untended and it is not well documented. Besides, agile manifesto states that "Working software over comprehensive documentation"(Beck et al., 2001). To conduct the estimation of requirements the PO can use different techniques as ranking, analytical hierarchy process and the value based estimation considered in 3.3. Some companies use requirements prioritization. However, two companies mostly make their decision based on the intuition or the voting as in case D. As in the literature all companies have a backlog. Unfortunately, we could not estimate the state of the backlog in the frames of this research.

As a member of scrum team PO also needs to participate in the daily scrums, sprint planning meetings and sprint reviews and retrospectives. It is worth to mention that companies do not follow the accurate scrum methodology and some companies do not have the daily scrums meeting. However, in considered companies PO is an irreplaceable

visitor of all conducted meetings. As the PM the PO also is a voice of customer in company. Therefore he or she needs to strive to get the feedback from customer using different channels and techniques to engage the stakeholders in product creation. In this question Russian companies (case A and case C) mostly rely on support or on the grapevine, while Finnish companies engage the customer into constant communication. TO my mind, this practice has to be widely used.

The PO also needs to check the quality of a product at the end of each sprint to decide on launching the product. Real examples show that everyone participates in testing procedure, but the decision about launching is made by business owner or by all members. According to literature PO also can change the direction of product. Considered startups are flexible and can easily change the direction. However, it is mostly the prerogative of the product owner as well or it is a result of general discussion depending on level of democracy.

According to agile PO also needs to measure processes using ROI. In the literature there is not an accurate regulation of what ROI need to be used. It depends on particular situation: company, product, team and etc. All cases approve this practice measuring the effectiveness of their departments. Besides, agile manifesto states that “Individuals and interactions over processes and tools”(Beck et al., 2001). The considered companies follows this principle. Therefore the level of informal interactions between PO and other team members is quite high.

5.2. Data Product Management Modeling in Startups

To get an effective decision PM has to rely on data. Regardless of who plays the role of PM – does it the responsibility of project manager, CEO, CTO and CEO or this is product owner – he needs to analyze information from different resources. Among project management activities we defined and analyzed next areas: requirements gathering procedure, requirements estimation and streamlining, release planning. Based on data analysis of companies and literature review we can conclude, that product manager needs to take into account next stakeholders: potential and current customers, key clients, partners, domestic and international market, competitors, external marketing companies and accelerator’s experts. At the same time, he or she can get this information by different ways: conducting the meeting with customers, clients, partners by himself or get this

information through other departments as well: sales, support, development and marketing. It is worth to mention that the good practice was used in case of B when a company has a KAM department for interaction with key customers. Therefore, this department is defined in matrix as well. Thus, regardless of differences in approaches to product management in companies the type of data gathering for making a decision is similar to traditional product management frameworks. The data interaction process is illustrated in two contexts on matrix (Table 11)

Table 11. Matrix of PM Data

departments/ resources	development	marketing	sales	support	key account manager
Market		development trends, international competitors: functionality, pricing, appearance, usability, market share			
Competitors		market share, new clients, new partners appearance, advertising companies, pricing, discounts, functionality.			
Existing customer				bugs, the level of satisfaction, areas of problems, suggestions for improvement: usability, functionality, appearance	
Potential customers			pricing objections, features, information about competitors		

Partners	integration issues		suggestions for integration		requirements concerning functionality, usability and appearance, satisfaction and quality estimation, the direction of development; critical errors
Key customers					
Roadmap					

If to arrange all resources in order to increase humidity, the first place is given to key customers. Through KAM companies get information about functionality, usability, appearance, pricing objections, the level of satisfaction with the product, bugs, critical errors. The same information is getting from the current customers, but they have less degree of importance for startups. On the second place, we can place the data from roadmap containing long-term oriented features and defining the common direction of product development.

The importance of others stakeholders is hard to define. It highly depends on the particular situation. For startups it is important to track changes in politics of their competitors: market share, clients, new partners, advertising companies, pricing, discounts, appearance and functionality. This responsibility is belonging to the marketing department. However, to convince potential customers to buy a product, sales need to be aware of this information too. Moreover, often potential clients provide this information to sales by themselves. To be on the wave of innovations, startups also need to be very sensitive to new technology trends and marketing needs. One of the purposes of the marketing department is to investigate the current market situation and makes a prediction. It is also worth to mention that partnership has significance influence on startups as well. The integration issues are getting from them in addition to suggestions concerning the direction of development, functional and view requirements

5.3. Model of Data-Driven Approach in Product Management

The amount of data about customers is growing rapidly. Therefore, PM faces the problem of how to extract the important information. Moreover, to track the development process and check the direction of the development process, PM can use metrics. There are a lot of metrics describing and analyzing the effectiveness of departments and product. Based on the study of Liebowitz & Suen (2000) where authors compared the different measurement theories and case analysis, we define the most important metrics, which require the PM attention. The focus of most companies is to customer satisfaction, therefore, most metrics are market-oriented. These key metrics are important for product positioning estimation. They allow PM to understand do requirements meet customer's needs or not. The whole defining metrics are in Table 12.

Table 12. Key Software Product Management Metrics

Development	Sales	Marketing	Support	Business
<ul style="list-style-type: none"> • Average Defects • Conformity with Plan/Deadlines • Velocity • Workload 	<ul style="list-style-type: none"> • Sales Traffic • Customer Acquisition • Conversion Rate to Customer 	<ul style="list-style-type: none"> • Monthly Unique Visits • Search Engine Rank 	<ul style="list-style-type: none"> • Statistics/Number of Supported Tickets • Customer's Estimation of Service • Time of Problem-Solving 	<ul style="list-style-type: none"> • Money Flow Through the Service • Amount of Completed/Uncompleted Deals • Customer Lost

The results of case study analysis show that main indicator using by startups for estimation of product success is money flow through the service and amount of deals completed or in opposite unfinished in the service. It allows estimate PM the popularity of service and also to define areas where the deal broke down. The metrics of development process facilitates the understanding of product quality (average defects). Metrics conformity with deadlines/plan improves the estimation of requirements during planning release version for time/effort estimation. The key metrics from sales departments are sales traffic and conversion rate to the customer. It is worth to mention that these metrics also highly depends on the effectiveness of work of this department.

Many companies now use the Google Analytics for marketing analysis. From these fields, the most important metrics are monthly unique visits and search engine rank. From support

the main metrics are statistics of supported tickets, time of problem-solving and customer's estimation of service. Information about the number of supported tickets and time of response are not tracked by PM, because according to the companies they do not illustrate the current areas of product problem or support effectiveness. All defining metrics are explained below.

Metrics of Product Quality and Following Plan (Average Defects, Conformity with Plan/Deadlines)

These metrics allow to PM track the development process - following to plan, deadlines. This information could be critical for launched product. In the case of time problems product manager has to be ready to it and offers a possible solution for customers or developers. Average bugs metric allows estimate the quality of the release, while conformity with plan/deadliness shows the accordance of planned to real processes.

Velocity (story points)

This is a typical metric for development in Agile. It illustrates the amount of work in one release. It could be calculated in story points (estimation of one unit of work) or a number of units.

Workload (time/effort estimation)

One of the effective Kanban practices is re-estimation of time spent by the programmer for feature development. This procedure allows improving the effort and time estimation precision, that increase the accuracy of next planning release process.

Sales Traffic and Customer Acquisition

Besides to think about customer satisfaction, PM also has to think about the feasibility of product development. These metric show the cost of the attraction of new customer. Sales traffic illustrates a number of new sales while customer acquisition – the cost of the new customer. The fluctuation of this metrics is to indicate the changing of product payback.

Conversion Rate to Customer

This metric reflects the transition of interested potential customers to current clients actively using services or buying the software solution.

Monthly Unique Visits

This metric illustrates the interest of potential customers to the software product. This is a number of people visiting the website the first time from the same device.

Search Engine Rank

The popularity of a website can indicate the interest of the customer. This metric illustrates the position of a website in searching services. No doubts, that ranking position in the searching engine could be changed artificially, nevertheless, this metric requires control.

Number of Supported Tickets

This metric represents a number of client's requests regarding the same type of problem. It facilitates to understanding in what areas clients have problems.

Customer's Estimation of Service

This metric illustrates the subjective assessment of service by the customer. It could be done as via the phone, as through application or website without any human interaction.

Time of Problem-Solving

This metric reflects the amount of time spent with the customer to solve the problem.

Money Flow Through the Service

This metric is the best indicator for companies offering the service. It provides the information about customer satisfaction. If the client does not like a new release, he just stops making deals through this service. Declining of this metric is the "red light" for a product manager.

Amount of Completed/ Uncompleted Deals

The first metric represents the number of new deals completed using the service, while the second one reflects a number of uncompleted deals. Uncompleted Deals metric could be used for understanding on what step client changed his mind, and how to improve service to avoid it.

Customers Lost

This metric is useful in companies using Regular License Charge (RLC) pricing strategy. It reflects a number of clients decided to not extend the contract.

5.4. Discussion

At the beginning of this study, we raise three research questions facilitating to reach the goal and aim of the research. The first one (Q1) implies investigation of existing approaches to product management in software organizations, particularly in a startup. To get the answer to this question we conducted the literature review. We compared the SPM frameworks and the role of PM in popular software development methodologies. It is worth to mention that flexible development methodologies have a significant influence on product development process. There are several separated roles carried out these abilities. Product Owner in Scrum, Customer in XP and Product Champion in Kanban.

Researchers analyzing the product management role in different methodologies are mostly focused on responsibilities of product manager. A study conducted by Sverrisdottir et al. (2014) explores the frames of PO within scrum team. Authors emphasizes the complexity and variety of product owner's tasks, but do not investigate the data sources facilitating to decision making procedure. A study conducted by Roure (2001) investigates the product champion's characteristics focusing on the degree of influence on the top level of management. This research allows us to compare different approaches to product management and identify key differences.

To understand what current practices of product management in startups and what data product manager requires to make decisions we conduct the diverse case study (Q2 and Q3). In addition to literature review data getting from interview and questionnaire helps to build the models of gathering requirements procedure in different styles of product management in companies. Framework analysis allows comparing different approaches to product management in startups and reveals common features influencing on it. These models contribute to the definition of common sources for requirement's gathering in startups. To control the direction of the product development PM has to put one's finger on the customer's pulse. Analyzing the available literature we found out multiple studies investigating the metrics of customer satisfaction in marketing field and metrics of software product quality (quality engineering). All of them are described the state of a

software product or attitude to it from different points of view: customer, finance, development. However, there is not a material describing what metrics are important and should be tracked by the product manager. Developed and presented KPI model shows the main metric illustrated the fluctuation of customer's needs and reaction to product changes. From our point of view, the tracking of exactly these metrics could be the base for product management decisions.

To get the reliable and valuable information we use the data triangulation technique. The first step is the analysis of website and the official group in social network gives precursor results about product/service, pricing, history of the company, partners, team members. Compared these data with information getting from the interview we found out the description of service/product providing by the company was true. However, in the case of C the last update of the website was in a previous year. Therefore, information about team members and partners was not correct or not full. The information about pricing is right, but interview reveals additional opportunity that wasn't mentioned on the website. Case B shows that declared position of the interviewer doesn't correspond the data on the website. Though, it is worth to mention that after some time the information was updated. In case A and D all information was correct. The last piece of data triangulation was questionnaire from other workers of the following departments: sales, support and development. The results from questionnaire approve the data concerning areas of responsibility, requirement estimation, information channels and using the software. To sum up, the data getting in the frames of this study from three resources is right with small imprecision.

6 CONCLUSION

6.1. Contribution of the Study

This research study has investigated the product management practices in startups. Nowadays, this type of companies is spreading. However, the significant failure rate indicates the insolvency of business and acceptance of wrong decisions. The applying of data-driven decision-making approach in software product management can help to increase the effectiveness of business even it is not big. The existing product management approaches are excessively time and work consuming. Therefore, startups let it slide relying on intuition. This study pays attention to the importance of software product management even in small companies. It shows the possible solution to product management in startups and defines the data that could be used by PM.

The major contribution of the thesis is the development of scorecard that allows monitoring the product development process. Many metrics are describing the development process (quality engineering), customer satisfaction, human effectiveness. However, it is impossible to track all of them. We defined the key indicators illustrating the current state of the product and giving the base for solid decision-making. Overall we identified 15 metrics from development, sales, support marketing and business sides. From development, PM needs to track metrics of product quality and effort estimation. From sales, the main important metrics are sales traffic, conversion rate to the customer and customer acquisition. The marketing department needs to provide information about, monthly unique visits and search engine rank. Support has to provide statistics regarding a number of supported tickets, time of problem-solving and customer's estimation of service. Besides, there are also a couple of major metrics from the business side that were mentioned by PMs for product success estimation. There is the money flow through the service, the amount of completed and uncompleted deals and customer losses.

Moreover, there are several studies considering the traditional frameworks for a product manager. However, no one investigates what type of data PM gets from other channels. The outline of PM interaction process shows that in common, the main resources and channels of getting information are the same as in traditional frameworks with one exception. The main resources are key customers, competitors, current customers, partners

and potential customers. As the main communication channels, there were defined the departments of companies. There are sales, support, development, and marketing. The exception is that aiming to be market driven and attract the large commercial partners some companies have a separated department – KAM. This division ensures the stable continuous interaction with the key customers for getting requirements from them for future development. Therefore, it is worth to notice, that this department has the biggest influence on product development in comparison with others.

Conducting the diverse case study allows to generalize the results for defining common trends of product management in startups. These features are listed in 4.4 as propositions. We found out that due to the lack of human resources the startups strive to organize product management gathering procedure autonomously. Moreover, the responsibility for product management usually is shared between technical and business experts, but the last word for the business owner. The feature selection procedure is mostly based on intuition rather than estimation. Also, short-term oriented features are preferable than long-term characteristics.

The comparison of different roles performing the product manager's duties was made for the first time in flexible methodologies such as Scrum, XP, Scrumban, Kanban. There are a couple of studies considering the differences between traditional frameworks of PM and also some material describing roles of PM in Agile and Scrum in particularly. In the literature review part, we identify the role who takes the responsibility of PM. There are Product Owner, Customer and Product Champion. Commonly, the area of these responsibilities is the same, but the tools and approaches are different and dictated by principals of methodology.

6.2. Limitations of the Study

This study has some limitations restricted the main findings. We used companies' websites for obtaining primary data regarding them. However, companies provide unstructured and incomplete information – some websites even do not have actual information about pricing, history or partners. Therefore, in some cases it was impossible to create a preliminary vision regarding the company before the interview. Moreover, it appeared that the information from the websites can even mislead as some of these websites have not

been updated for a long time. The internal documentation or private observation could give more reliable and valuable data.

The second source of data was the interview with PMs. Due to the fact that respondents were busy and overwhelmed by their activities, the duration of each interview was strictly limited to 40-50 minutes. This time interval allows highlight the main activities of PM regarding the decision-making and data collection, but details concerning competitor's analysis, roadmap planning, pricing strategy were outside of the study. Increasing the time duration and amount of future meeting could enhance the quality of data getting from companies. Besides, some of the interviews were conducted via Skype. It is a good alternative to a face-to-face meeting. However, we have noticed that respondents were more opened to dialog and collaboration during the real meeting.

Moreover, despite the fact that confidentiality was guaranteed to the company, sometimes respondents benched from a direct answer. The possible reason for that is the reluctance of respondents to show their company in unfavorable view. The anonymous questionnaire could improve the honesty of respondents but it is not applying for qualitative research focusing on particular cases.

The using of unstructured approach to interview gave a broad field for questions, but it makes the analysis incredibly hard. Different order, free formulation of questions and different information getting from the interview creates difficulties for the analyst. Applying of a structured method of conducting the interview helps to drive the conversation in a right way and get the same type of data that makes the analysis easier. Due to free flow, some conversations continued in the wrong direction that is interesting for future research, but it is not valuable for the aim of this study. The benefit of this approach is a possibility to improve questionnaire and add additional questions for next companies. However, the lack of these questions on previous meetings makes cross-case analysis concerning this topic impossible. However, it is worth to mention, that this experience is incredibly valuable for future quantitative research. Not restricted by boundaries of the structured interview, we used different ways of asking questions. We also defined the frames of the research field. Based on this data it is easier to create a common draft of a questionnaire for a big amount of companies.

From my point of view, the number of companies was optimal for this qualitative research. Time and work constraints do not allow take more companies for consideration. No doubts that this amount of companies does not reflect the situation in all startups. Therefore, the findings cannot be applied to other companies with the same degree of accuracy. However, the results could be used as a hypothesis for quantitative verification.

To sum it up, we can draw several conclusions to minimize the limitations of this research. Firstly, using internal documentation as a data source can enhance the validity of getting data. Secondly, the conducting of several interviews with the same presenter increases the accuracy of getting data. Thirdly, face-to-face meetings raise the trust and creditability of respondents. Fourthly, the structured interview makes easier the cross-case analysis and identification of main findings. Finally, conducting the quantitative research can approve or refute the main findings of this research.

6.3. Suggestions for Future Work

This study is based on an investigation of product management practices in startups focusing on data-driven approach in particular. The research uses a qualitative approach for analysis. Therefore, the main suggestion for future work appears from limitations of this research. The main finding of this study could be used for quantitative verification.

Based on identified KPI metrics we could conduct a quantitative research to identify the degree of importance of each metrics for PM. To my mind, the best way is to create an electronic questionnaire with the scale of importance of each KPI for a PM. Next, these data could also be used for creation a dashboard. This tool of visualization helps to product manager track the product development and customer satisfaction. Due to the time limitation, we did not compare the different software tools for a product manager. As a background for research explaining above we can investigate the current software tools aiming to support product management activities.

Moreover, research shows that some decisions of PM are based on intuition, not on data. One of the possible branches for the future research is the investigation of influence intuition decisions on product and the degree of this aspect importance in product management decisions.

Startups have the most democracy environment in comparison with other companies. Some companies even do not have a person who is fully responsible for product management decisions. As a result, this responsibility is shared between members and conflict questions are solved by voting. This approach implies the high possibility of product development in different directions outside of common strategy. Therefore, it is highly interesting the track of company progress during 1-2 years – to see the effectiveness or ineffectiveness of this approach.

Based on literature review we can also investigate the differences between Product Owner, Customer and Product Champion on practice. The literature review shows that the gathering requirements process is almost the same. Therefore, the main focus of this investigation could be on estimation activities and on the procedure of building the release. The qualitative research in companies, who use different methodologies for product development (XP, Scrum, Kanban, Scrumban), could compare pros and cons of their approaches to product management.

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APPENDICES

APPENDIX 1: Interview Questions for Product Manager

I. Company General Information (filling by correspondent)

Name	
Product	
Size (N workers)	
Website	
Presenter	
Position	
E-mail	
Number	

II. Company structure

	Question	Goal
	Could you tell about the history of the company? How long are you at the market?	Introduction, experience
	Could you describe the hierarchy and responsibilities in the company?	Hierarchy, roles, responsibility
	How would you describe the unique features of the company? Do you use any methodology or standards in the management of the company?	Methodologies, standards
	What communication channels (tools) do you use to exchange information between employees? (Specialized	Software, communication

	software)	channels
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III. Product Manager

	Could you tell more about your responsibilities as a product manager?	PM activities
	The management of product strategy requires continuous communication and exchange data with other departments according to Product Specification, development process, versioning, pricing, sales, distribution, upgrade and support. Could you describe the collaboration process in your company?	Document flow
	Who is responsible for defining the strategy in your company? Business Goals?	PM and board relations
	Are you satisfied with current product management process? In your opinion, how situation when business owner and product manager is the same person affects on business/product? When would you delegate this responsibility to person?	

IV. Marketing Analysis

	What are the drivers to develop this product?	Marketing data
	If you will have the opportunity to get free any results of Gartner market analysis what would you ask? Have you ever used the service of external analytical firms?	External marketing data
	In your opinion what are your advantages in	Competitors

	comparison with your competitors? Do you track changes in the product of your competitors?	analysis, (who is responsible for it) Marketing unit
	Could you estimate the level of customer's satisfaction of your product? Why did you give this grade? What indicators do you use?	Metrics for estimation of customer satisfaction

V. *Software Product Strategy and Pricing*

	Do you have any document that describes and formalize product strategy, his aims, objective, structure?	Portfolio management
	Do you connect with other workers developing it? Why?	Portfolio management
	How do you estimate the value of this document? What is the difference between such overall product strategy and a set of various plans (like product development plan, marketing plan, sales plan)? Whether the structure is the same for all your products?	Existence PDP, MP, SP and connection with SPS document
	How your partner influence on your Product Strategy ('Shtritch M', 'Moyo delo', 'mail.ru', 'ATOL', Tinkoff).	Partners, data
	Could you tell about your pricing strategy? Why did you choose especially this one? Have you ever conducted any experience with the price?	Pricing, metrics

VI. *Resource Product Planning*

	How do you manage the resource in your organization? Do you need to negotiate these decisions with other workers?	Interactions with departments: development, support, sales, marketing, finance
	What data is the most important when you make decisions concerning milestones, releases?	
	What data do you use making decisions about what features will be included in next release? Who have the biggest authorities in this question?	
	Do you consider user desires and comments planning next release? What channels do you use?	
	Do you conduct a telephone interview or plan meeting with customers?	
	Do you consider desires of potential users?	
	How do you estimate risks in your company? Based on what data you conduct this estimation?	
	Support collect a lot of information concerning customer problems. Do you track the problem database of your customers?	

APPENDIX 2: Questionnaire for Development

<p>PRODUCT MANAGEMENT IN STARTUPS: FOR DEVELOPMENT</p>
<p>1. Name of your company:</p>
<p>2. Areas of responsibility:</p>

Check all that apply.

- Engineering Management
- Project Management
- Project Requirements Engineering
- User Experience Design
- Quality Management
- Other:

3. What metrics do you use for requirements analysis?

Check all that apply.

- None
- Time
- Risks
- Business value from customer's side
- Business value from partner's side
- Critical importance in terms of legislation
- Other:

4. Who has the biggest authority in making decision-related to requirements including in sprint (the role)?

5. What indicators influence on your performance estimation?

Check all that apply.

- None
- Amount of defects
- Conformity with plan (functionality)

- Conformity with budget
- Conformity with deadlines (time limit)
- The time spending on defect fixing
- Other:

6. How do you track the development process, following the schedule?

Check all that apply.

- No, we don't track it
- Information System (please write what IS)
- Formally by words (organized meeting)
- Informally (just by words)

7. What software do you use for controlling the development process?

Check all that apply.

- None
- Microsoft Office
- Product Management Software
- Project Management Software
- Self-created
- Software

APPENDIX 3: Questionnaire for Sales

PRODUCT MANAGEMENT IN STARTUPS: FOR SALES

1. Name of your company:

2. Areas of responsibility:

Check all that apply.

- Sales Planning
- Channel Preparation
- Customer Relationship Management
- Operational Sales
- Operational Distribution

3. What indicators influence on your performance estimation?

Check all that apply.

- Conversion of customers
- Amount of repeat purchases
- Response time
- Amount of sales
- Objection handling
- Average duration of conversation
- Other:

4. How do you inform the company about the results of your work?

Check all that apply.

- Informally (by words)
- Formally by words (organized meeting)
- Formal documentation using doc systems (Microsoft Office, Google doc)
- Formal documentation using CRM system

How do you know about the functionality of new release?

Check all that apply.

- Informally (by words)
- Formally by words (organized meeting)
- Group mailing
- Access to formal documentation (CRM)
- Other:

APPENDIX 4: Questionnaire for Support

PRODUCT MANAGEMENT IN STARTUPS: FOR SUPPORT
1. Name of your company:
2. Areas of responsibility: <i>Check all that apply.</i> <ul style="list-style-type: none"> <input type="radio"/> Service Planning and Preparation <input type="radio"/> Service Provisioning <input type="radio"/> Technical Support <input type="radio"/> Marketing Support <input type="radio"/> Sales Support <input type="radio"/> Other:
3. What metrics do you use for requirements analysis? <i>Check all that apply.</i> <ul style="list-style-type: none"> <input type="radio"/> None <input type="radio"/> Risks <input type="radio"/> Business value from customer's side <input type="radio"/> Business value from partner's side

- Business value from investor's side
- Critical importance in terms of legislation
- Other:

4. What indicators influence on your performance estimation?

Check all that apply.

- Amount of solving problem
- Time of problem-solving
- A number of new tickets
- Customer's estimation of support quality
- Other:

5. How do you inform the company about the results of your work?

Check all that apply.

- Informally (by words)
- Formally by words (organized meeting)
- Formal documentation using doc systems (Microsoft Office, Google doc)
- Formal documentation using CRM system

6. How do you know about the functionality of new release?

Check all that apply.

- Informally (by words)
- Formally by words (organized meeting)
- Group mailing
- Access to formal documentation (CRM)
- Other:

APPENDIX 5: Framework of Companies

THEME	CATEGORY	A	B	C	D
basic information about the company	type of product	software	web service	application software+ web service	application software
	type of company	mono product	mono product	mono product	mono product
	sector	B2B	B2C & B2B	B2B & B2C	B2C
	country	Russia	Finland	Russia	Finland
	internationalization	-	+	-	+
	government affect	high, because of a specific product	medium	high, because of a specific product	medium
hierarchy, divisions	N employees	15	22	8	7
	N departments	4	5	3	3
	departments	sales, marketing: content manager, development and support (+designer, counter)	sales, customer support, marketing (digital and traditional), key-account management, development, top level.	sales, support, development	software development, business development: marketing and sales

	managing	CEO	CEO, Company Board	CEO and CTO	CEO
	management style	vertical of power	democracy	emphasized democracy	democracy
product management	responsible person	CEO	Project Manager	CEO and CTO	team members
	areas of responsibility	strategy, marketing analysis, product planning	pricing, requirements, product strategy, control of working workload	strategy, the vision of the company, targeting market vs release planning, milestones	strategy, the vision of the company, targeting market and milestones, release planning
development	methodology	agile	scrum and kanban	scrum, agile	scrum and kanban
	sprint	2 weeks	2 weeks, strictly	1-2 weeks	1 month, regularly, depends on complexity
	traction meetings	at the beginning of the sprint	daily scrum meeting	at the beginning of the sprint	no
	testing			team	team members on another side (business)
	design			developers	developers
	distance workers			developers	business employee (for market expansion)

requirements	requirement's sources	existing and potential clients, strategic goal, integration tasks	existing clients, potential clients, strategic goals	existing and potential clients, strategic goals,	existing customers (what's up group), partners, strategic goals
	interview with clients	on the stage of MVP with potential clients existing: through support, not any scheduling meeting	call to constant customers who using system constantly	used to be, but it doesn't bring value	"What's up group": weekly survey for 100 active users, chosen by cold calls: shopping rewards in exchange
	storage for requirements	Google doc	Jira	Slack	Google doc
	consideration of potential clients	flexibility, the willingness to develop needed feature (through sales)	development process build n realization requests from existing customer's	flexibility concerning pricing issues, economic feasibility concerning additional features	focus on current clients
	gathering procedure	all workers write it in a google doc, then appointed presenter from each department to check it	requirement gathering session, meeting once a week to discuss it with all team the strategy, product. The room:	all workers write it in SLACK, then after groping and analysis they are transferred into Trello	all workers write it in a google doc

			everything goes into backlog		
	the final decision about features	mutual decision meeting: CEO, team lead, designer	CEO, PM presents 3 features for development for choosing each 2 weeks	in consensus with CTO	voting
	estimation	workload; value from different department's side	frequency	workload	workload, the value on intuition level
	influence of other departments on it	development: only from a workload point of view, operational point of view sales and support: gives their estimation based on their point of view	can, but have a small influence on making a decision	each participant can influence on it via discussion	each participant can influence on it via discussion
documents	roadmap	+(for 12 month)	+(3 years, +3 months)	+for 1 year	+short term and long term (5 years)
	operation plans	sales, marketing	sales, marketing	sales, marketing	sales, marketing
	company strategy	+	+	+ responsibility: CEO	CEO

	product strategy	-(included into PS)	+	model in SLACK	+
software	backlog	Google doc	Jira	Slack	Google doc
	communication	SLACK	skype, Task	Slack	Slack
	task management	TRELLO	Jira, kanban board	TRELLO	Google doc
	sprint	2 weeks	2 weeks	1-2 weeks (depends on features)	1 month (depends on features)
	PM tools	-	-	-	-
	document flow	Google doc	Jira	Office 365	Google doc
marketing	marketing sources	- local competitors analysis -partners -international market	local competitors analysis -partners -international market	competitors, existing customers	the company has their own niche- no competitors at the local market
	competitor's analysis	local and international(once in 3 months +situation- depended)	iterative	not scheduled, iterative	was at the beginning
	responsibility for competitor's analysis	PO	PO, marketing, CEO	CEO	CEO
	sources for competitor's	-web-site -news or articles	web-site,	-the main resource is new	do not pay attention

	analysis	-hiding clients (calls to competitors)		customers -hiding calls at international market (the national market is specific, easy to check who called to you)	
	international version	+	+	-, focused on local market	+
	Services of external business analytics companies	-	+, didn't bring value	+ marketing research at the beginning	at the beginning
	the level of environment-competitiveness	medium	extremely high	high	low
pricing	type of price	fixed but variable: MLC* month, quarter, half of year, year	flexible floating percentage	% from transaction, fixed price	commission based
		depends on a number of connected devices, starting from 2 nd each one is cheaper	depending on value bringing by the customer -	flexible depends on the particular case	relatively new company- price was counted, not gonna be changed to not confuse the customer
	reasons	-the comfort of	-cheapest price,	-economical	economical

		<p>the client (season clients)</p> <p>-competitor's imitation (copy leader's price with 30-50% low)</p> <p>-commitment to transparent price unlike the competitors</p>		<p>calculations, experiments with price</p>	<p>calculations; Competition, empiric research, experimenting</p>
	responsibility	CEO	PO->CEO	CEO	PO->business
partners	number	10	>6	>5 (?)	>5
	schedule for meeting	no, in frames of negotiating meetings	no in frames of negotiating meetings	no	no
	effect on product	product integration product expansion	medium, can effect as a customer's ordering features	weak	weak, integration's issues
finance	control	by CEO	by CEO	by CEO	by business guys
	reporting	counter	-		
	The break-even point		+, the goal is to get the whole market, become a leader	+, unit economics goal is in amount of connected companies	+, 3-4 years

Other	testing	automated	whole team		quality assurance
	government affect	high, because of a specific product	medium	high, because of a specific product	low
	accelerator's services	+	-	+	-
	Notes			brunch could be closed if it's admitted as unviable	hard to find out common language between business and development
	new technology, innovations			think to solve the problem of maintenance of other time zone trough index speech-solving the problem by innovations, not by a number of people	
	KAM	no	have key account manager for interaction with customers, trying to confuse the main competitor	no	no

	customer's satisfaction		our service: yes, but it's already good, so we stopped providing service:	no	Ranking service in application
	main indicator	-	money turnover through service	money turnover through service	money turnover through service, new users
Support	responsibility	Technical Support	Technical Support	Technical Support	-
	requirement metrics	Business value from customer's side; Critical importance in terms of legislation	Business value from partner's side; Business value from customer's side;	Business value from customer's side; Critical importance in terms of legislation	-
	an indicator of performance estimation	Time of problem-solving; Customer's estimation of support quality; Number of overdue tickets	Amount of solving problem; Time of problem-solving; Customer's estimation of support quality	Time of problem-solving; Customer's estimation of support quality	-
	the way of inform	Formally by words (organized meeting)	Formally by words (organized meeting);	Formally by words (organized meeting);	-

			Informally (by words)	Informally (by words)	
	knowledge about new release	Formally by words (organized meeting); Access to formal documentation (CRM)	Formally by words (organized meeting); Access to formal documentation (CRM)	Formally by words (organized meeting); Access to formal documentation (CRM)	-
Development	responsibility	Engineering Management	Engineering Management	Project Management; Engineering Management; Quality Management; Project Requirements Engineering	Engineering Management Project Management Project Requirements Engineering; User Experience Design; Quality Management
	requirement metrics	Time; Business value from customer's side; Business value from partner's side; Critical importance in terms of legislation	Time; Business value from partner's side; Business value from customer's side; Critical importance in terms of legislation	Time; Business value from customer's side; Critical importance in terms of legislation	Time; Risks; Business value from customer's side; Critical importance in terms of legislation

	an indicator of performance estimation	Velocity (Story Points)	Velocity, Number of defects Conformity with plan (functionality); conformity with deadlines (time limit)	Conformity with plan (functionality); conformity with deadlines (time limit)	Number of defects Conformity with plan (functionality); conformity with deadlines (time limit)
	authority at the new release	Product owner	CEO	a compromise between CEO and CTO	The majority makes the decision.
	track the development process	SCRUM	Information System; Formally by words;	Information System; Formally by words; Informally	Information System; Formally by words; Informally
	tool for control development	Jira	task board	task board	Project Management Software
Sales	responsibility	Sales Planning; Customer Relationship Management; Operational Distribution	Sales Planning; Customer Relationship Management; Operational Sales	Sales Planning; Channel Preparation; Customer Relationship Management; Operational Sales;	Sales Planning; Channel Preparation; Customer Relationship Management; Operational Sales;

				Operational Distribution	Operational Distribution
an indicator of performance estimation	Conversion of customers; Amount of sales	Conversion of customers; Amount of sales	Conversion of customers; Amount of sales	Conversion of customers; Amount of sales; Customer Acquisition	Conversion of customers; Amount of sales
requirement metrics	Business value from customer's side;	Business value from customer's side; Critical importance in terms of legislation	Business value from customer's side; Critical importance in terms of legislation	Business value from customer's side; Critical importance in terms of legislation	Time Risks Business value from customer's side; Critical importance in terms of legislation
knowledge about new release	Informally (by words); Group mailing	Formally by words (organized meeting)	Formally by words (organized meeting)	Informally (by words); Formally by words (organized meeting)	Informally (by words); Formally by words (organized meeting)
the way of informing about your work	Formally by words (organized meeting); Formal documentation using CRM system	Formally by words (organized meeting); Formal documentation using CRM system	Formally by words (organized meeting); Formal documentation using CRM system	Informally (by words) Formally by words (organized meeting) Formal documentation	Informally (by words) Formally by words (organized meeting) Formal documentation

				using doc systems (Microsoft Office, Google doc)	using doc systems (Microsoft Office, Google doc)
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