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**Proceedings of the International Conference
dedicated to the
50th anniversary
of the Department of Informatics**

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FOREWORD

These proceedings contain the papers of the International Conference “Information and Communication Technologies in Business and Education” which took place at the University of Economics – Varna, Bulgaria, 18 October 2019.

The international scientific conference is dedicated to the **50th anniversary of the Department of Informatics at the University of Economics – Varna**. The conference is also dedicated to the 100th anniversary of the University. The included papers describe recent scientific and practical developments in the field of information and communication technologies, information systems, and their applications in business and education.

The papers in the Proceedings are peer reviewed and are checked for plagiarism.

C O N T E N T S

1. Kamelia Stefanova, Dorina Kabakchieva Challenges and Perspectives of Digital Transformation	13
2. Julian Vasilev, Marian Cristescu Approaches for information sharing from manufacturing logistics with downstream supply chain partners	24
3. Abdel-Badeeh M. Salem Computational Intelligence in Smart Education and Learning	30
4. Marian Niedźwiedziński Proposal of the Multi-aspect Analysis of ICT's Needs in Management	41
5. Krasimir Shishmanov Digital Transformation in Bulgaria	52
6. Tatyana Makarchuk, Valery Trofimov, Svetlana Demchenko Modeling the life cycle of e-learning course using Moodle Cloud LMS	62
7. Vanya Lazarova Exploring the functionality of Bulgaria eGovernment site	72
8. Veselin Popov, Petya Emilova Big data and information security	83
9. Luben Boyanov Approaches for enhancing digitalization and digital transformation in supply chain management	91

10. Monika Tsaneva	
Challenges of GDPR compliance in consumer financing companies	103
11. Todorka Atanasova	
Main factors influencing digitization in construction companies	116
12. Silvia Parusheva	
Digitalization and digital transformation in construction – benefits and challenges	126
13. Snezhana Sulova	
The Usage of Data Lake for Business Intelligence Data Analysis	135
14. Pavel Petrov	
Web security technologies used in banks of Estonia, Latvia and Lithuania	145
15. Tanka Milkova	
ABC analysis of inventory in MS Excel	155
16. Ivan Kuyumdzhev, Radka Nacheva	
Choosing Storage Devices with Consideration of Backup and Restore Performance in MS SQL SERVER	166
17. Yanka Aleksandrova	
Predicting Students Performance in Moodle Platforms Using Machine Learning Algorithms	177
18. Latinka Todoranova, Bonimir Penchev	
M-learning Applications	188
19. Boris Bankov	
The Impact of Social Media on Video Game Communities and the Gaming Industry	198

20. Velina Koleva, Svetoslav Ivanov	
Social media and the recruitment of IT professionals in Bulgarian IT companies	209
21. Deyan Mihaylov	
Modeling and Simulation of Some Functions of Two Independent Random Variables	225
22. Oumar Sy	
Using Association Rules as Semantics for Domain Ontologies	233
23. Ina Stanoeva	
Social media possibilities for improving arts marketing performance	247
24. Iskren Tairov, Vladislav Vasilev	
Perspectives on mobile devices adoption in healthcare sector	257
25. Angelin Lalev	
Deep Neural Networks for Detection of Credit Card Fraud	263
26. Miglena Stoyanova	
Priorities for Digital Transformation in Property Management	275
27. Mihail Radev	
Organizational Variants of IT Department at the University	284
28. Mariya Armyanova	
IoT problems and design patterns which are appropriate to solve them	291
29. Yavor Christov	
Corporate Big Data and Hybrid Integration Platforms	306

30. Ivan Belev	
Making financial data readable using Inline XBRL	314
31. Ivan Belev	
eXtensible Business Reporting Language (XBRL) – a technical overview	322
32. Anna Sobczak	
Entrepreneurship in the education of university students	331
33. Mihaela Markova	
E-commerce in the process of digital transformation: preparedness, requirements and technological tendencies	343
34. Petya Petrova	
Basic Soft Computing Methods In User Profile Modeling	353
35. Petar Dimitrov	
Methods for storing authentication data – a historical review	369
36. Svetoslav Ivanov	
Development stages of starting software company, problems and approaches for software development	382
37. Antonio Hadzhikolev	
The role of the smart city concept in the process of urban transformation	397
38. Oumar Sy	
Ontology-based materialized views for reverse engineering: Toward a set of conceptual guidelines	410

DEVELOPMENT STAGES OF STARTING SOFTWARE COMPANY, PROBLEMS AND APPROACHES FOR SOFTWARE DEVELOPMENT

Svetoslav Ivanov¹

*¹ University of Economics / Informatics, Varna, Bulgaria,
svetoslav_ivanov@ue-varna.bg*

Abstract

The article aims to review the problems and stages of development in starting software company. The subject is starting software company that is defined with limitations, goal. Problems and stages of product and company development are reviewed from different perspectives – entrepreneurs, entrepreneurial process, product development, software as a product, company and process management. The main goal is to develop products or services to prove their expediency, feasibility and market potential. Specific models for stages and development approaches are presented to manage the entrepreneurial process and reach market success and growth. Product and business model development are based on lean development and agile software development methodologies.

Keywords: *software development, stages, problems, entrepreneurship, starting company.*

INTRODUCTION

Information technologies (IT) development and the effect on the business and society drive their implementation in different areas of economic activities. The role of IT and information systems move from supporting role and business management to key competitive advancements and vitally important activities. Many industries change their processes through the implementation of digitalization which is based on IT technologies. This shift in the IT role is achieved through innovation in information systems, technological base, business management, and entrepreneurship. In this article, we will review two key components important for this process – the software product¹ and the innovation

¹ In the article we will refer as a product to products and services without going into details and differences.

process by creating new software products in starting software companies. The topic is important, because:

- The process of digitalization changes other existing industries
- The intensive rise of the software products industry.
- High level of uncertainty and companies' failures (Blank, 2013).
- The success of SME is key for economic growth (EU commission, 2019)

Therefore, the subject of the article is to review the problems and stages of creating new software products by the entrepreneur in a starting software company. The article will define the terms in this subject, the goals of a starting software company, review different problems and stages of development according to different perspectives and methodologies.

1. STARTING SOFTWARE COMPANY

The key objective of this article is the starting software company. By the means of the name, this term belongs to the terms starting technology company, technology start-up, starting enterprise, software company. The legal base in the European Union and Bulgaria uses the term enterprise and separates the enterprises in four categories – micro, small, medium and big. The distinction is based on the size of the company measured as the number of employed people and annual turnover or the value of assets. Using this classification, we will focus mostly on micro and small enterprises - less than 50 employees and less than 10 million Euro turnover or assets (European Commission, 2019). Another approach is to measure the annual revenues or the stage/amount of investments. Or the simple criterion "before becoming a big company". They are equivalent to the definition for size above.

The second approach for defining starting or start-up company is the age. The definitions in the literature are different for the age – up to three years, up to 5 or 10 years. The technological development and shorter cycle of innovation insist on period of fewer than 5 years. A similar criterion is “have little or no operating history” (Blank, 2013).

The third approach defining a company is based on the key goal in the business – to develop a new product, to apply a business model, to prove vitality and potential growth (Ries, 2011). The definition for a

start-up from this point is “a company or project initiated by an entrepreneur to seek, effectively develop, and validate a scalable business model” (Katila, Chen and Piezunka, 2013; Ries, 2011). Similar and related goals are to reach satisfactory product-market fit, to develop customer base where the focus is on searching clients, adapting the product and business model that fits the market (so-called Customer Development Model) (Blank, 2013). It distinct from Product Development Model in an established company and is the most important criterion for distinction between a starting and an established company.

The fourth approach is to give an accent, especially for the term start-up company, depending on whether the company wants to become big or more precise “to develop and validate a scalable business model” (Blank, 2013). In this article, we will skip the starting companies which plan or behave to stay small – freelancers, small family or service businesses. Therefore, we will add this definition “search for growth or scalable model”.

Including the word software in the term shows that the company is going to develop technological product software. In this article, we will use a technology company in the means to produce a technological product. In the literature, there are sufficient definitions for the term software, it’s content and development, and specific features we review below.

In the literature can be found different forms of entrepreneurial activity. Many of them are activities that copy other company activity and products, reuse a ready product, business model, brand at a high level like a franchise, business acquisition, etc. We will focus on a model with own product and business model. Even when it uses third party components, a known business model, the company has at some level unique product, model, brand, etc.

Finally, a starting company is initiated by an entrepreneur. We will use the term entrepreneur for a single entrepreneur or a team of entrepreneurs who initiate and lead a starting software company. There is researches (Davidsson, 1989; Storey, 1994) that describe and prove that the main factor for SME company success and growth is connected to the entrepreneur and his/her/their personal goals, motivation, orientation to market, capability for growth, and professional management. Therefore, the entrepreneur is a key factor.

After all these definitions we could summarize that a starting software company is a new micro, small or medium company up to 5 years, founded by one or team of entrepreneurs that develop a new software product and search business model that proves feasibility, vitality and product-market fit with growth potential. We should note that there are differences between these companies. The criteria could be goals, model, strategy, processes, product, team. These could be (and not limited to):

- The entrepreneur – one or a team, type of team and combination of skills.
- The company mission, values and selected innovation strategy (Drucker, 1999).
- Type of product – product, service, platform, target industry and problem.
- Customer (problem) or technology (find market application) driven (Blank, 2013).
- The type of business model they use (Maurya, 2012; Croll and Yoskovitz, 2014).

2. PROBLEMS

Development of new software product and creating a new business in a starting company is a complex activity. It includes many problems to solve, decisions to take and actions that must be done. We will review here many problems described in the literature as entrepreneurial problems, management problems, software development problems.

First, the entrepreneur should establish their team and vision of the company. We stated the entrepreneur and his personal goals, motivation, orientation to market, capability for growth and management as one key factor. An entrepreneur should have appropriate personal features and character, as well as proper knowledge, skills, and training in the area. The Entrepreneur and the team should have capability in company management, market environment, strategy formation and execution (Storey, 1994; Blank, 2013) and of course, to work as a team. If they do not have the skill should take either training, take into the team of entrepreneurs a co-founder who has the skills and knowledge, use mentors or hire employees.

Second, a starting software company is an entrepreneurial process – to develop new software product, prove vitality and success on the market, establish and grow company. The selection and execution of the process is an important decision. It helps to keep focus and be organized. The key questions are well defined in the literature (Stevenson, et.al, 1985; Drucker, 1999; Maurya, 2012; Blank, 2013; Ries, 2011), and the main ones are:

- What business to do, why, what are the type, goals and the area of business.
- Discovery of opportunity, problem, solution, evaluation, and selection of opportunity.
- Develop a plan – goals, strategy, business plan, define product, market.
- Determine the necessary resources – financial, material, personnel, intellectual, etc.
- Test the market, acquire customers, refine the product for customers.
- Manage with competition and competitive forces.
- Enterprise management – strategy, marketing, production, personnel, resources.
- Growth management – improve business model, increase markets, channels, etc.

Third, the theory and practice show that it is most effective for the entrepreneur to follow a process and use practices and tools that help to solve the above questions efficiently. Therefore, the stages of development and processes from various perspectives are presented in the next point.

Fourth, the entrepreneur should develop a new product that faces market opportunities and uncertainty. There are various conditions that the entrepreneur should take into consideration and problems to solve (Ries, 2011; Blank, 2013; Alvarez, 2014; Kahn, 2012):

- Limited resources – both financial, people, material, information.
- Limited time of opportunities – competition also searches for opportunities.
- High uncertainty – competition, technology change, market forces, and opportunities.

- Understanding the market and customer needs.
- Find a solution and make it a product - customer problem to solve, a solution to form as a product or market application for a technological product.
- Market validation – the product is successful when the market accepts it.
- Make partnerships – team, with mentors, investors, vendors, customers, other partners
- Fast learning – gather experience for market fast and effectively and implement it.
- Development of a validated business model.

All these above require a specific approach and methodology, methods and tools to manage with them. Taking any decision about them requires the entrepreneur to know the state of the company's resources and environment. Therefore, specific tools for analysis should be used to discover a possible solution. Managing the processes and the business, validating the business model and other tasks require taking appropriate decisions. This could be done with the use of appropriate metrics. Many authors (Croll and Yoskovitz, 2014, p.45-62; Ries, 2011; Blank, 2013) state that the metrics should be actionable (lead directly to take decisions), specific for the business model and the stage, and even exists one leading metrics.

Sixth, entrepreneurship requires the use of resources. The entrepreneur should make this available or accessible. The company needs financial resources, needs proper people for company tasks, material, informational, intellectual property. Some authors bring the idea of intellectual capital which is the result of entrepreneur's knowledge, skills, the created knowledge in company and product development, available marketing connections, structural capital for company building, etc. An entrepreneur should take care of all these to be available in a possible way – taken from the team, borrowed, invested, purchased, acquired, developed.

Seventh, the entrepreneur should take care of company management. This means to manage people, processes, resources, relationships with external partners – investors, vendors, customers, employees, con-

tractors, participation in ecosystems, market and virtual networks, etc. Also, at some point, when the company is established, the product is at good state and sells in a niche market, the company must take actions to scalable and do growth. This leads to sequential problems like investments, management changes, personnel changes, coordination problems, etc. Because growth is important, next point reviews this perspective.

Eight, the starting software company does software product. The software has specific features described in the literature as a product, both production and support, and we will mention some of them (Larman, 2001; Poppendieck, 2003; Schwaber and Beedle, 2001; Panayotova, Dimitrov, Petrov, Bychkov, 2016; Polkowski, Vasilev, Ghamdi, 2016):

- Fast development in IT and software technologies require short releases.
- Complexity of the product and various vendors of platforms, components, tools, etc.
- Quality is a complex term – implement features, security, scalability, performance, user experience, robustness, integration with 3rd software or systems and other.
- High-quality requirements or increasing quality requirements over time.
- Serious investment/resources before first working or marketable copy.
- Multi-disciplinary – requires the participation of various specialist.
- The product defects share in all copies of the product.
- The high price of software development specialists.
- There is extensive work with knowledge and a need of constant learning.
- Requirements - not fully clear initially, need discovery, may change over time.
- Must work on various devices, platforms, browsers, servers, etc.
- Development of technologies requires regular upgrades
- Regular upgrades because of component changes, bugs, security threats, legal, etc.

- The product requires regular support service.
- Quality or time of delivery could be a critical problem
- Specific licensing rights to meet and keep.

Therefore, the process of software product development should reflect these changes. Two key concepts in successful software development are user involvement and requirements description and stability. For starting software company this is not the case – initially, the user or customer is not clear, requirements may change during the search of market niche fit, as well as other changes. The feedback is not always direct – asking questions about getting the answer. It might need an analysis of data, experiments to validate a supposed requirement. Also, business analysis is required for the financial and marketing effect of the requirement.

3. STAGES OF DEVELOPMENT

Development of new software product and creating a new business in a starting company is a complex activity. It includes many decisions and actions that must be taken and are described in the literature as an entrepreneurial process. One of the most popular definitions for the content of this process is from Stevenson including four phases – definition and evaluation of opportunities, development of the entrepreneurial plan, determining the necessary resources and enterprise management (Roberts, Stevenson, et.al. 2006). Each phase contains different steps. While using such a process is helpful, we should review more specific processes for the definition of starting software company.

First, such an approach and process should count for new product development. Therefore, we could refer to processes under the name new product development (NPD). It is defined as “a thorough understanding of customers' needs and wants, the competitive situation, and the nature of the market is an essential component of new product success” (Kahn, 2012). Their project structure includes four phases:

- Requirements building – what product should do to meet market/business need.
- Product design – how the product will meet the requirements.
- Product implementation – construction and testing of the product.
- Commercialization – production and market launch.

Based on this structure, there are various models developed. From the mentioned in the literature we should mainly note these models - BAH model (base model), Stage-Gate model (the well-known Waterfall model in software development (Kahn, 2012; Larman, 2001) appropriate for stable environments), Lean Startup - a model inherited from Lean Development (Ries, 2011), Exploratory Product Development by Dothar and Morrisay.

Next, we should review the typical limitations of a starting software company and its product. First, there are entrepreneurial limitations for a starting business - limited resources, limited time of opportunities, high uncertainty and high-rate of failure (Blank, 2013; Ries, 2011). Next, it should meet the principles of successful entrepreneurship – clear vision, appropriate strategy, flexible design, focus on product development, market validation, business model development, and validation, etc (Blank, 2013). Third, the specific conditions for software products - fast development in IT technologies, changes in software technologies, various vendors for platforms, tools and components, aggressive behaviour from large companies to develop new versions and new features on short cycles, high quality requirements and high price of software development specialists, need of short learning cycle (Poppendieck, 2005; Ries, 2011). Therefore, we need to review methodologies that help the company manage uncertainty, do market and model validation, follow fast learning curve to discover the product requirements and do short cycles of development.

The Theory and Practice, especially in product development and software development propose such methodologies. They should be flexible, manage uncertainty through adaptation, feedback and fast learning. Also, to manage appropriately quality, time and resources for product development. These methods are known as agile and follow the general NPD stages – Requirements, Design, Implementation, Deployment. Each stage has iterations with actions like planning, execution, release, getting feedback and updating from feedback. Each iteration ends with a given level of product development done. During the iteration, the product and plan could be adapted to the market requirements and discovery process. The control of time is through fixed time per iteration. The adaptation is

via prioritization in planning and feedback at each iteration with regular feedback from the client (Larman, 2001). Appropriate methodologies are Lean Software Development (Poppendieck, 2003), Scrum (Schwaber and Beedle, 2001), Extreme Programming (Larman, 2001). In each approach the flow of work is determined by the client with accent to be effective (maximum value) and velocity. There are tools for feedback, prioritization, following empirical results and learning.

We should note that the above methodologies have specific characteristics – they are dedicated to software product development with a regularly available client and feedback. In a starting software company, there is no client or the client and requirements are not clear or refined, so they must be discovered. Also, the business model is not clear and it should also be built and validated. Stage Requirements is most open to risks.

As we mentioned above the company does an entrepreneurial process that has the features of discovery and market validation for the product, business model and growth/scalability. Therefore, we should use methods into the first phase “Requirements” to determine the product requirements and as feedback in later iterations during the design, implementation and commercialization. Such methods are developed as:

- Fuzzy Front-End of NPD – formulate the concept, decide investment (Koen, 2001).
- Design Thinking – discover a problem and design solution for it (Dorst, 2012).
- Customer Development – develop a product and initial customer base (Blank, 2013).
- Lean Start-up - based on Customer Development and Lean Development principles brings a hypothesis-testing based model (Ries, 2011; Maurya, 2012).
- Lean Canvas – a tool for business modeling that adapts Osterwalder’s Business Model Canvas for starting companies (Maurya, 2012).

The above methods can be integrated with Agile Development as shown in Figure 1. It combines Design Thinking to generate the idea for problem and solution, Lean Startup for building and validating the solution and business model for product-market fit, and Agile Development

to implement it. As shown, Lean Startup consists of cycles “build, test and learn” for the solution and product-market fit similar to Agile Development cycles. Both, Lean Startup and Agile Development process could go in parallel and have information flow, because of the first supplies requirements from learning activity and the second, the product to test. Another combination, called Lean Launchpad, is to combine Business Model Canvas (Maurya, 2012), Customer Development and Agile Development (Blank, 2013).

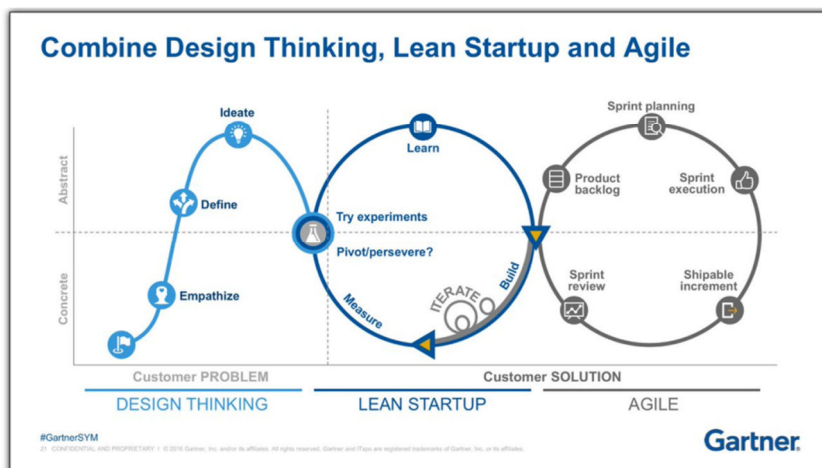


Figure 1. Integration of Design Thinking, Lean Startup and Agile. (Source: Gartner, Inc.)

Another perspective we could review is the integration of building a product, team and business in a simplified model. Such a simplified model with minimum needed activities is in Figure 2. The first phase is Formation with tasks to establish team, define problem and solution as idea and concept. The second phase is Validation to build a Minimum Viable Product (MVP is defined by Ries, 2011) that proves market vitality and potential. The third phase is Growth to the focus on the company organization to establish and grow.

When a starting company is developed through stages the entrepreneur should count for the business results to make appropriate decisions.

A model connected to the customer base and business results is the one presented by Croll and Yoskovitz (2013, p.153-157) when they describe the analytics used to measure the success of the business. The five stages are close to the stages in the above models and are listed in Table 1.



Figure 2. Startup Development phases (Source Startup Commons, available from <https://www.startupcommons.org/startup-development-phases.html>)

Table 1

Stages list according to Croll and Yoskovitz (2013), Maurya (2013), Ries (2011).

№	Stage	Croll and Yoskovitz explanation	Lean Startup terms
1	Empathy	Identify a real problem and solution	Customer Development
2	Stickiness	Early customers tests for market fit	MVP building
3	Virality	Early customers acquisition and tests	Organic growth, Sticky engine
4	Revenue	Optimize the revenue	Monetization, Price Engine
5	Scale	Expansion - markets and channels	Inorganic Growth

We should mention the question of financing starting companies. The interest in financing is because a starting company has a window of time for the opportunities, there is competition and financial agents search for investment opportunities. In most cases, the investment stages are connected to stages of the business as shown in Figure 2. Stage Formation is funded by the entrepreneur's resources, friends, family. Stage Validation (called Seed Capital) from entrepreneurs, business angels, crowdfunding, etc. At stage Growth, the interest is from and to venture capitals, funds, etc in different levels.

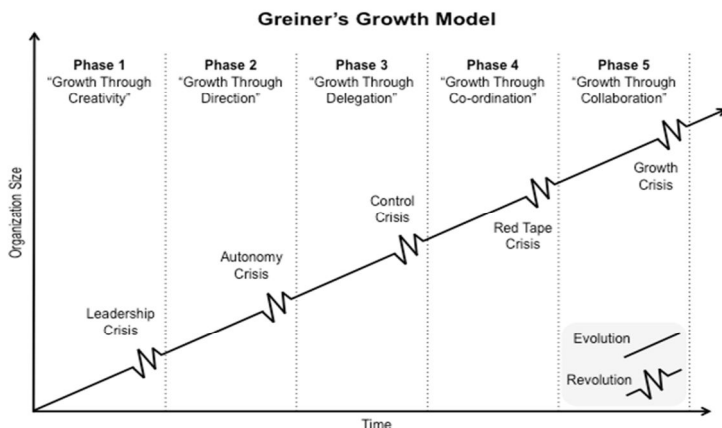


Figure 3. The Five Phases of Growth. (Source Grainer 1998)

Finally, we should view stages of development from management and organizational view. One such model is from Larry Greiner with 5 stages of growth and revolutionary crisis's between stages as shown in Figure 3. "The resolution of each revolutionary period determines whether or not the organization will move forward into its next stage of growth" (Greiner, 1998). The model is useful with recommendations for organization, management practices and actions in each phase to reach the goal for growth and scalability. Otherwise, the company may stay at a given stage, stop the growth or even fail if it is in a too early phase.

CONCLUSION

The current article defined the term starting software company and the main company goal. It could be successful with proper new product development that fits the market niche with a proper business model to reach company vitality and growth. The problems and stages are discussed from different perspectives of the company definition. The stages are reviewed with focus on Lean Product Development and Agile Software Development.

REFERENCES

1. BLANK, S. (2013) *The Four Steps to the Epiphany*. K&S Ranch Publishing.
2. CROLL, A., YOSKOVITZ, B. (2013) *Lean Analytics*. Sebastopol, CA: O'Reilly Media.
3. DAVIDSSON, P. (1989) *Continued entrepreneurship and small firm growth*. Stockholm: The Economic Research Institute.
4. DORST, K. (2012) *Frame Innovation: Create new thinking by design*. Cambridge, MA: MIT Press.
5. DRUCKER, P. (1999) *Innovation and Entrepreneurship, Practice and Principles*. New York: Harper & Row.
6. EUROPEAN COMMISSION (2019) *What is an SME?* Available from: https://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en [Accessed: 2/08/2019].
7. GRAINER, L. (1998) *Evolution and Revolution as Organizations Grow*. Harvard Business Review. May-June 1998.
8. KAHN, K. (2012). *The PDMA handbook of new product development*. 3 Ed. Hoboken, New Jersey: John Wiley & Sons Inc.
9. KOEN; et al. (2001). *Providing clarity and a common language to the 'fuzzy front end'*. Research Technology Management. 44 (2): p.46–55.
10. MAURYA, A. (2012) *Running lean: iterate from plan A to a plan that works*. The lean series (2nd ed.). Sebastopol, CA: O'Reilly.
11. LARMAN, C., (2003) *Agile & iterative development: A manager's guide*. Pearson Education.

12. PANAYOTOVA, G., DIMITROV, G., PETROV, P., BYCHKOV, O. (2016) *Modeling and data processing of information systems*. 3rd International conference on Artificial Intelligence and Pattern Recognition (AIPR), Lodz, Poland, IEEE, pp.154-158.
13. POLKOWSKI, Z., VASILEV, J., GHAMDI, R. (2016) *ICT green ecosystem*. Studies and Proceedings of Polish Association for Knowledge Management, 82, 2016, pp.61-73.
14. POPPENDIECK, M., POPPENDIECK, T. (2003) *Lean Software Development: An Agile Toolkit*. Addison-Wesley Professional.
15. RIES, E. (2011) *The Lean Startup*. Crown Publishing Group.
16. ROBERTS, M., STEVENSON, H., SAHLMAN, et al. (2006) *New Business Ventures and the Entrepreneur*. 6th Ed. New York: McGraw-Hill/Irwin.
17. SCHWABER, K., BEEDLE, M. (2001) *Agile Software Development with Scrum*. Upper Saddle River, NJ: Prentice Hall.
18. STOREY, D.J., (1994) *Understanding the small business sector*. London: Routledge.