

Managing New Product Development Projects Using Lean Startup Approach

Marko TÖDTLING

Miro HEGEDIĆ

Nedeljko ŠTEFANIĆ

Faculty of Mechanical Engineering and Naval Architecture
Ivana Lučića 5, Zagreb, Croatia

Abstract

Current trends on the market, such as mass customization, high competition, short product life cycles and constantly changing customer needs ask for a different approach to project management in the development of the new products. Therefore, an ability to quickly adapt to changes in the client needs and wishes, concise documentation comprising only key elements are in general today's must-have in a term of efficient and effective project management. This paper proposes a new model for project management, primarily for new product development projects, based on Lean startup approach. The authors present a model whose key elements and phases were recognized through the literature review, and which afterwards was tested by conducting a case study on a single project. Further research should include application of this model to various types of projects in various types of industry and observation of the correlations between them, as well as conducting a more detailed research on elements of the model, such as project charter or project plan documentation.

Keywords: project management, lean startup, project management model, customer interviews

1. INTRODUCTION

Nowadays, there are many "new" methodologies that can be found in the field of project management, one of them is Lean methodology. These "new" methodologies, such as agile methodology (Agile), Six Sigma, Scrum, etc., are connected to different types of projects and it is important to mention that these "new" methodologies have appeared as an alternative to the traditional one [1].

Traditional project management, also known under the name "waterfall approach" [2] is the oldest approach in project management. Waterfall approach is based on assumption that a unique set of rules and guidelines is applicable to any type of project, regardless of its complexity and industry of application. This principle is derived from the vision that a project is simple, linear and predictable, with clearly pre-defined limits and no subsequent need for change, and as such it is easy to be planned. Phases are completed in sequence, one after another, which is the reason of its name "waterfall approach."

Highly turbulent, competitive market requires from companies greater flexibility, faster implementation of changes and costs cutting in order to stay competitive. With respect to this new challenges, traditional approach is considered to be suboptimal due to its highly descriptive documentation and linearity followed by inability to adapt to changes caused by high uncertainty [1][2][3].

There are numerous reasons why projects fail but inaccurate requirements, change in project objectives, undefined risks/opportunities, poor communication and undefined project goals are the most common ones, according to the PMI survey [4]. Nowadays, project management has gained a big momentum and project management community is focusing its efforts on minimizing the possibilities of failure. For instance, in 2015 organizations wasted US\$109 million for every US\$1 billion invested in projects and programs [4]. That is quite a lot of money to be spent due to failures in projects, and that number must be reduced.

All of the above-mentioned facts call for a further research on increasing a success rate of projects. The objective of this paper is to propose a model for managing product development projects created to avoid the most common causes of project failures. The model is primarily tailored for new product development projects with the intention of making it applicable to all types of projects. The Proposed model combines elements of PMI planning phase [5], Lean Startup methodology [6] and project charter modelled after Lawrence P. Leach's project charter [7].

It is a common thing that innovators come up with a great idea for a new product and immediately throw themselves into making the same, spending a large amount of money and time, and in the end no one wants to buy their product. This happens when decisions are based on false assumptions without consulting the customers first. As a response to this problem, arose the Lean Startup methodology introduced by Eric Ries in 2008 and later popularized through his book "The Lean Startup"[6]. The methodology emphasizes the need to get in touch with customers as soon as possible and to build products with them. The process of developing products is based on Build-Measure-Learn (BML) feedback loop and validated learning. The goal is to go iteratively as fast as possible through the BML feedback loop and to achieve as much as possible validated (scientifically based) learning through hypothesis testing in order to save time and money [6].

However, there are certain limitations to the proposed model, since it was tested on a single project, which might not be sufficient for assessing its applicability to all types of projects. Nevertheless, it represents a firm basis for a further research.

In the first part of the paper, research methodology that consists of two stages is explained. In the first stage a review of the literature on project management (in general) is conducted and the most common problems regarding the traditional approach are defined. Since while conducting the literature review the most common causes of the failures in project management were found, in the second stage of the research methodology a model was proposed to deal with the named problems and tested using a case study. Finally, paper ends with conclusion and recommendations.

2. LITERATURE REVIEW

2.1. Project management

Several definitions of project can be found in the literature. PMI (Project Management Institute) defines project as a temporary endeavor undertaken to create a unique product, service or result [5]. By the term temporary it is understood that a project has a clearly defined beginning and end, and therefore a definite scope and resources. A project is not a routine operation, but a specific set of operations designed to accomplish a specific goal. IPMA (International Project Management Association) defines a project as a unique, temporary, multi-disciplinary and organized endeavor to realize agreed deliverables within predefined requirements and constraints [8]. According to ISO 21500 project is a unique set of processes

consisting of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective. The achievements of the project objectives require deliverables conforming to specific requirements, including multiple constraints such as time, cost and resources [9]. Having in mind the above-mentioned explanations, we can define project as a time and cost bounded endeavor with the aim of producing a specific product or service that meets certain quality. It considers a specific set of activities that differs from the usual work.

2.2. Project failures

Project managers are still facing some challenges, such as delivering project deliverables within the project budget, project requirements and meeting customer's expectations. The main questions that arise are: What are the most common reasons of failing? How can they be tackled? According to the PMI's 2015 Pulse of the Profession, on average, 64% of projects are successful (meet their goal) and organizations are continuously wasting US\$109 million for every US\$1 billion invested in projects and programs. The fact that only 2.5% of companies successfully complete 100% of their projects [10], is even more astounding. The six most common causes of project failure are [4]: (1) changing priorities within organization (40%), (2) inaccurate requirements (38%), (3) change in project objectives (35%), (4) undefined risks/opportunities (30%), (5) poor communication (30%), (6) undefined project goals (30%). Figures add up to more than 100% because respondents could choose multiple answers.

Taking given figures into account, a new model was created in order to tackle the identified problems and improve the way projects are managed. In the next section, the model is explained and afterwards examined which problems can be solved using the proposed model.

2.3. Model

The model consists of four main phases: (1) Initiating, (2) Planning, (3) Execution and (3) Closing, as shown in the Figure 1.

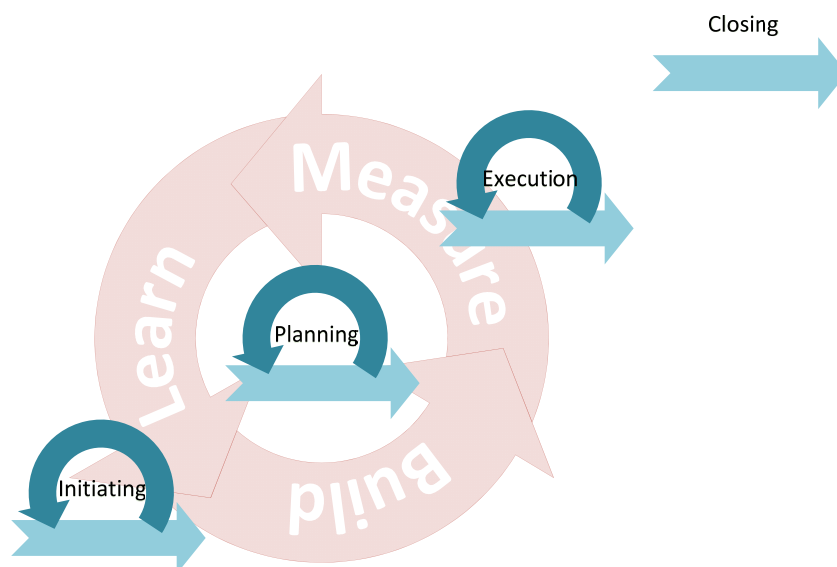


Figure 1 – Build Measure Learn Loop

The first three phases of the process represent a Build-Measure-Learn (BML) feedback loop (Figure 1) adopted from Lean Startup methodology [6]. BML is at the core of the Lean Startup methodology. BML feedback loop is a way of retrieving feedback from the customers and the project team needs to focus its effort on minimizing the total time through this feedback loop [6]. As it is stated in [11], value is added in product development by producing useful information.

The first step of the BML feedback loop consists of making a Minimum viable product (MVP). MVP is not the minimal version of the product, rather it is that version of the product that enables whole pass through Build-Measure-Learn loop with a minimum effort and least amount of development time, therefore it helps entrepreneurs to start the process of learning as quickly as possible. Probably the easiest definition to understand what MVP is would be that it is a "good enough" version of the product to be used for hypotheses testing. More accurate definition would be that MVP is that version of a new product which allows a team to collect the maximum amount of validated learning about customers with minimum effort. MVPs, in general, differ in complexity. They come in shape of mock-ups, complete prototypes or just presentations. One of the best known MVP is probably the one by Drew Houston – CEO of Dropbox. He made MVP in the form of video of 4 minutes in which he showed how to use the software, with the video his intention was to test if people are interested in the software product which they have been building. In addition, he deliberately targeted a community of technology early adopters and in a short time received feedback.

Eric Ries defines validated learning as scientifically validated learning that is achieved by running frequent experiments. Experiments allow entrepreneurs to test each element of their vision and in that way they can identify and eliminate the sources of waste right on time [6].

The second step is based on obtaining feedback from a representative group of potential customers. The best way to describe the second step would be in the words of Steve Blank: "Get out of the building". It is crucial to go out and find what others think about your product, to be more specific, what your costumers think about it. Finally, when the feedback is obtained and analyzed, hypotheses are confirmed or rejected [6], [12], [13].

Initiating phase of the project is a conceptual phase and the output is an 'A4 Project Charter'. Project charter is the first document of the project, it directs the project team in planning the project and it also gives the authority to the project manager [7].

It needs to be concise, transparent and contain all the important information regarding the project. Before proceeding to the next phase, at the project kick-off meeting the charter is approved and signed by all the stakeholders in order to ensure that all the parties are on the same page. If the charter is approved, the team can proceed to the planning phase and if not, the team should 'measure' and 'learn' from the feedback of the stakeholders and build a new version of the project charter. This process should be repeated as quickly and as efficiently as possible until all the parties agree upon it.

Elements of the A4 Project Charter (modelled after [7]): (1) mission and vision statement, goal, (3) project constraints (time, budget and quality), (4) stakeholders, (5) key assumptions, (6) success criteria, (7) risks, (8) authorities.

Planning phase is consisted of the elements of the PMI's planning phase. PMI's PMBOK gives a clear structure of elements of the planning phase and that is the reason why it was used as a reference in this research. These elements are discussed in the project charter at a general level, and in the planning phase they need to be defined in more detail.

Elements of the planning phase: (1), define stakeholders, (2) define the requirements, (3) define the scope, (4) define the activities, (5) define the activity resources, (6) define human

management, (7) define time schedule, (8) define project budget, (9) define quality, (10) identify risks, (11) define the responses to the risks, (12) define the communication plan, (13) procurement plan, (14) define the project plan. Once the project plan has been made, it needs to be approved and signed by all stakeholders to be sure that all stakeholders have good understanding of the project plan, and agree on it.

Phase of Execution, in this phase, project plan is being executed and the output is an MVP, which is given to one part of the customers for a revision and feedback. It is vital to test first the leap-of-faith assumptions, and subsequently the others. Constant delivery, feedback and learning allow minimizing the effort in building the features that users will not consider valuable [6]. After receiving the feedback, it needs to be decided whether to persevere or pivot with the product / feature. Eric Ries [6] defines pivoting as a structured course correction designed to test a new fundamental hypothesis about the product, strategy, and engine of growth.

In the phase of Closing, learning is a big part of the whole process and it is very important for all the project team members. The mistakes that might have been made can be used as learning opportunities, and that is the reason why it is important to document these "lessons learned" so they could be applied to other projects of similar type. Also, an important part is effort recognition and acknowledgement which should be incorporated in everyday practice of an organization.

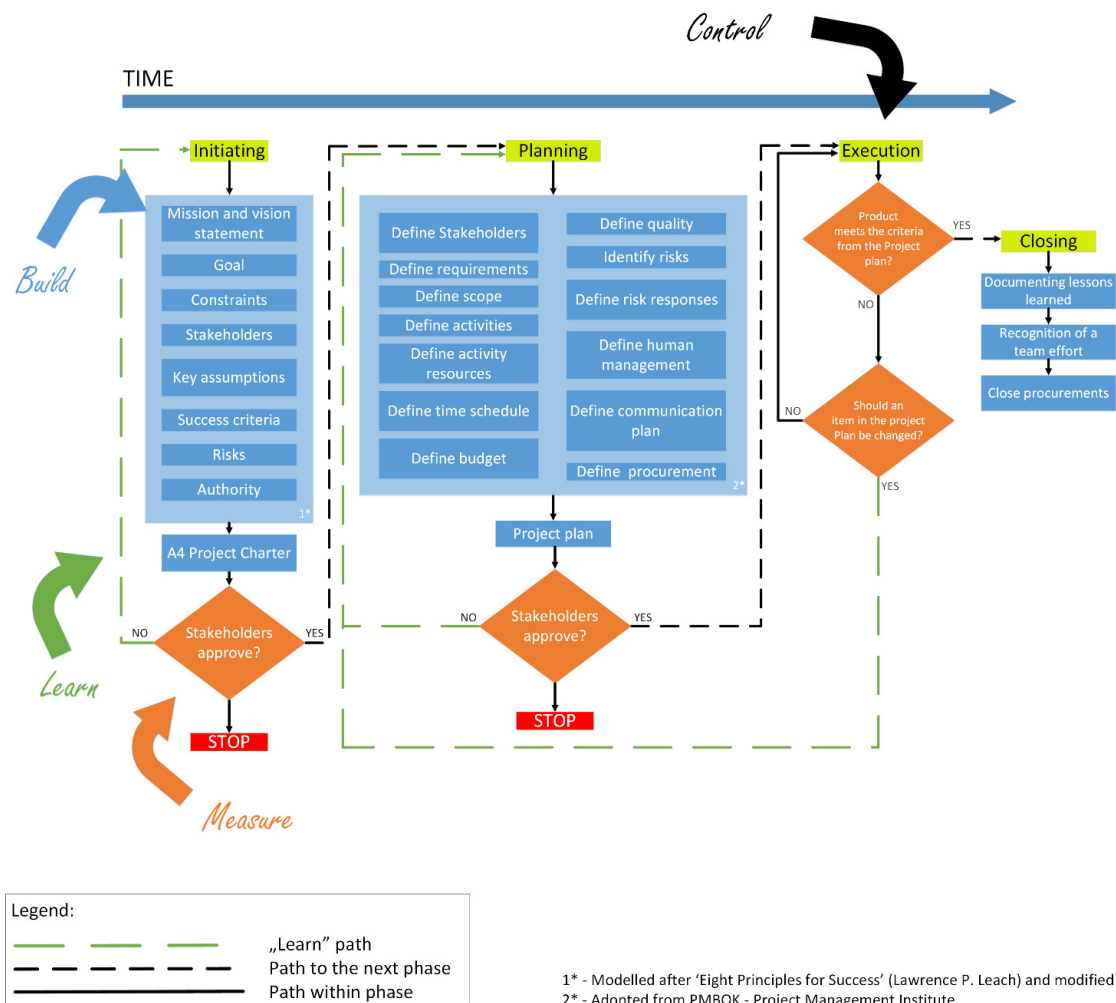


Figure 2 – Lean Startup Project Management Model

The model was made to deal with the identified problems, although some of them are beyond the scope of the proposed model. For instance, there is no way to deal with a problem of changing priorities within organization because it is under the competence of top management. Other problems were carried out through the model. As opposed to traditional approach where there is a problem dealing with the changes within a project due to exhaustive documentation, Lean tries to anticipate changes with incremental building of a final product and through a constant feedback from the customers in order to avoid overwork and wastes. One of the important parts of the planning phase is building a communication plan which should contain detailed specification of stakeholders, frequency of communication, method of communication and the person responsible. Also there are checkpoints between the four main phases of the project, as shown in the model with orange rhombi, and at these points all the stakeholders should be gathered around the round table to discuss and plan past and future activities. Using the given model there is no way of omitting defining risks/opportunities or project goals, as they are compulsory elements of the model.

3. CASE STUDY

The project was conducted using the mentioned model. The first idea of the project was to improve the way of finding companies for carrying out quality student internship by encouraging the exchange of experience between students who have already done it and those who are interested in doing it.

The crucial elements which had to be determined at the very beginning of the project were the project constraints, stakeholders and key assumptions. Although these elements may be seen as less important, they need to be carefully defined. Project team members should always keep in mind that making a new product is based on a set of assumptions and leaning on the wrong information could be fatal. Therefore every element should be thoroughly considered. Well defined constraints enable the team to identify maneuvering space in case of disturbances in project such as realization of some of the detected potential risks. Finally SMART (specific, measurable, achievable, results-focused and time-bound) goal was defined. The purpose of SMART goal is to ensure that everyone involved in project is aware of what the main goal is, how, why and when it needs to be achieved. Subsequently, mission and vision statement, success criteria and authority allocation were established. Information from the users about their needs can be obtained through customer interviews and through direct observation. Direct observation is carried out on the spot where the user is faced with the problem and allows the observer to gather information without intervening in the environment. Another way is through customer interviews, which is the principal way of gathering information in the Lean Startup methodology [6]. Since a part of the team was already in a situation as customer, project team made first project assumptions by putting, or better said getting back themselves in the customer's place in order to anticipate their potential problems. Feargal Quinn says [14]: *"You need to think like a customer. You need to be able to wear the customer's hat, to walk in their shoes. You need to get a "feel" for the customer. In a real sense, you need to be able to become the customer."* Once the problems were identified, team generated a list of ideas during a brainstorming session. One of the ideas was to make a special folder containing students' reports on experiences gained during the internship, which would be available to all interested students.

The first leap-of-faith assumption consisted in identifying the need for structured system through which students could filter companies according to the quality of their internship. In first customer interview series with students that assumption was confirmed which gave team a firm basis to continue with the project initiation.

In order to get to know the entire process better, meetings with students' internship coordinators and the chief coordinator were arranged. At those meetings, the initial idea was presented and a feedback was received. After the first few meetings, some significant changes were introduced. In order to make the students' reports on internship experiences easier to access and use, and more suitable for further upgrades, it was decided that they should be collected using the available technology (computers and internet) instead of hard copies. That way, a part of documentation in hard copies could be replaced by digital versions. Also, this would allow internship coordinators to easily track the progress of students finding the companies for internship. At that point idea was pivoted and coordinators became also the customers of the future product. A new idea was born – could the system be built as a subsystem of existing CMS (Content management system)? This was followed by another Build-Measure-Learn cycle and meeting with Computation Centre of FAMENA to determine if the system could be integrated in existing CMS, in which case the development would be accelerated. The assumption was confirmed.

As new information appeared, all the elements of project charter needed to be revised. Now, six different groups were identified – students, professors, companies, administration of the faculty, Computing Centre and the project team. It was identified that students are going to have the most benefits of such project. Administration was determined as project sponsor as they were supposed to ensure the resources necessary for implementation and also as the link to the companies. In the other hand administration was also a key stakeholder as this project positively correlates with socially responsible behavior. Computing Centre was responsible for building the system. After determining all the elements, it was time to meet all reached stakeholders to hear their suggestions and opinions. In a short time, meeting with the administration of FAMENA was arranged and by then, key assumptions were evaluated: (1) there is a need for improving the existing system of finding appropriate companies for performing the internship, (2) coordinators and students have recognized the value of the project, (3) the system could be embedded in existing CMS

Administration of FAMENA supported the project and opened the door to the third key customer – companies. During the project initiation phase project team built several MVPs that helped the learning process start as quickly as possible. Different MVPs were built for each customer and each series of customer interviews allowing thus examination of specific assumption of different customers. Interviews and questionnaires were carried out (face-to-face and using e-mail) with customers (companies, professors and students), data was collected and afterwards analyzed.

3.1. Customer Interviews

Customer Interviews consisted of four parts: general questions about the customer, questions about their present practice, presentation about our vision of this type of system (MVP) and, finally, getting the feedback from the customers. The first part of the interview was designed to get to know the customer by using a set of general questions to create an accurate customer profile. Instead of using the method of direct observation, in the second part, respondents talked about the whole process – their habits, needs and problems which they are facing while doing their jobs. Additional questions were used to direct the interview in a right way to find out all relevant information. This set of questions was followed by a presentation of the product based on previously set assumptions. In this case presentation was an MVP which did not require programming and the necessary infrastructure that otherwise such a system would require. Afterwards, feedback about the presentation was collected and questions were asked to determine whether the assumptions were correct or not. Questions were open-formed so

that they wouldn't affect the answers of respondents. During the analysis of collected data, list of deliverables was revised. The maximum duration of the interview was 1 hour. Interviews were recorded (if allowed), and afterwards transcribed and compared to the field notes. The gathering of data lasted about 15 weeks, and another 2 weeks were needed for processing the data. For each group of customers, a representative group was made. During the initial phase, a profile of each customer was made. It was determined that medium and larger companies will be more suitable for conducting customer interviews because of their internship capacities. Also, among the companies, those that have already established a collaboration with FAMENA were identified as more likely to participate in such a project. Company customer group consisted of five medium and four large companies.

To be a part of the student customer group, the only condition was that the student has already had an internship. That was crucial because in that way, the actual problems which occur while selecting the appropriate company could be identified. Group of professors consisted of all the professors who were in charge of student internships (course coordinators), and willing to contribute to the building of a new system. The table below shows questions that were used as a part of a customer interview with the companies. The table contains columns with questions and columns with explanations of what we wanted to find out. For customer interviews it is essential to know what we want to find out in advance. With the first 6 questions we wanted to make a user profile, and questions 7-27 were used to define the existing work practices. The last two questions were asked after the presentation of the MVP.

Table 1 – Questions for the customer interviews

	Question	What do we want to learn?
1.	Company name	Basic data
2.	Number of employees	Basic data
3.	Do you have an HR department?	Basic data
4.	Why do you offer student internships?	Basic data
5.	How long have you been taking on student interns?	Basic data
6.	How many students do you take on an annual basis?	Basic data
7.	How does the process of arranging student internships look like?	Basic data
8.	Who determines the department in which the student will work? Who are the people involved in the process of placing students into departments?	Basic data
9.	Are the students assigned to a mentor, and do you plan their tasks in advance, before their arrival to the firm?	How is internship organized in specific company?
10.	Do you place students according to their preferences / knowledge?	How companies assign students to departments?
11.	Are you satisfied with your student interns that were chosen using the existing method?	What is their opinion on current situation?
12.	Do you get any feedback from students after they finish their internships?	How do they ensure quality of the internship?
13.	How do you ensure the quality of the internships?	How do they ensure quality of the internship?

	Question	What do we want to learn?
14.	Do you request a report from student interns regarding their experience at your firm at the end of the internship?	Is there any system in place to ensure quality of the internships?
15.	Do you currently take part in some projects with the students? How did you start your cooperation with these students?	Are companies willing to cooperate on projects with students?
16.	Is the number of student interns at your firm increasing or falling? Why do you think that is?	What are their future plans?
17.	Do you think you could increase the number of quality students applying for internship at your firm? In what way?	What possibilities for improvement do they see in the system?
18.	Do you give scholarships to students? Why?	Do they offer scholarships and why?
19.	Are the internships at your firm payed?	Does company pay for the internship and why?
20.	How do you find your employees?	Where do companies search for new employees?
21.	Do you hire your former interns? If you do, would you say that you do it frequently?	How do they evaluate current interns in the hiring process?
22.	Do you have a budget meant for finding your interns or employees?	Is there a planned budget for internships?
23.	Do you advertise your firm to get publicity at the labor market? What are the methods of your advertising?	How do they find interns?
24.	What do you do after student has finished with the internship?	Do companies evaluate students work or keep in touch with them after the internship?
25.	Do you take students on the internship during the whole year?	What is the best period for internship?
26.	Which criteria matter to you in the process of choosing your interns?	What information should we ask from students?
27.	Would you consider to announce project vacancies for students? (Thesis, master thesis etc.)	Readiness to collaborate on projects
28.	Would you add any features to this system? Why?	To recognize main features of the system that matter to them
29.	Would you change any features of this system? Why?	What could be improved and which features of the system matter to companies.

4. FINDINGS AND ANALYSIS

During the customer interviews a lot of information was gathered. The table below shows the list with the proposed features of the system with the numerical value that indicates priority. Numerical value was assigned to the features according to the number of times they were mentioned by the costumers. In that way it was easy to determine which features are essential and need to be implemented, and which are not as important, but some of the costumers would like to have them (there is a difference between necessity and desire). In the Table 2,

features that were discovered during customer interviews are marked with asterisk, others were identified during brainstorming sessions.

Table 2 – Features priority table

Feature	Priority before CI	Priority after CI
Students curriculum vitae	1	1
Upload projects	3	2
Authorization of projects	*	3
Upload certificates	1	4
Framework for managing students	5	5
Field of interest	2	5
Rating of internship	3	6
Enable applications for internship throughout the year	*	7
Recommendations of professors	*	8
Motivational letter	*	8
Place of residence of students	6	9
Rating of internship divided in several categories	4	9
GPA (Grade point average)	*	10

5. CONCLUSIONS AND RECOMMENDATIONS

Using the new developed model that combines Lean Startup methodology, structure of planning phase from PMBOK and the elements of A4 Project Charter proved itself to be the right way of dealing with most common problems in managing the project. Clear and well-structured road map of the project can be very helpful to beginners, and also to expert project managers. Seeing the big picture provides a clear insight to the whole process, makes it easier to follow the progress and execute activities. Moreover, it gives an opportunity for all team members to be involved during the whole process, so it also could be considered as a knowledge sharing tool.

BML in combination with MVP impersonates lean at its finest. MVP was made based on assumptions, customer interview was conducted, feedback upon MVP was obtained, new ideas were generated and the process was repeated. Using BML feedback loop in combination with MVP proved to be a very useful set of tools, especially while conducting customer interviews where we learned the essential information about customers and how our final product is going to look like.

To make the most out of using the model it is recommended to use tools like MVP (minimum viable product), customer interviews and using the BML feedback loop as fast as possible. The time required for passing each cycle of the BML feedback loop is of the utmost importance – the quicker the better. During the project, product pivoted a few times and the customer segment was extended thanks to the customer feedback, but the vision stayed the

same. The perfect example is the way of retrieving and using student experiences. The first idea was to collect them as hard copies, but afterwards it turned out that it would be much more convenient if they were in a digital form. Contrary to projects aiming to develop a new product, where it is possible to completely change targeted customers, in our case the most important customers – students and companies didn't change thanks to initially set hypotheses. Customer Interviews allow project managers to learn directly from the customers and to capture their needs. As such, it has proved to be the most useful tool at the beginning of product development.

The proposed model is limited due to the fact that it was tested on a single case study. However, it gives a firm basis for further research.

6. REFERENCES

- [1] Collyer, S., Warren, C., Hemsley, B., Steven, C.: Aim, Fire, Aim—Project Planning Styles in Dynamic Environments, *Project Management Journal*, Vol. 41, No. 4, 108–121, 2010.
- [2] Haas, K.: *The Blending of Traditional and Agile Project Management*, Project Smart, 2007.
- [3] Laufer, A.: *Project Planning: Timing Issues and Path of Progress*, Project Management Institute, 1991.
- [4] Project Management Institute (PMI): *Pulse of the Profession®: Capturing the Value of Project Management*, (2015).
- [5] Project Management Institute (PMI): *Project Management Body of Knowledge (PMBOK Guide) Fifth Edition*, 2013.
- [6] Ries, E.: *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*, CROWN PUB INC, 2011.
- [7] Leach, L. P.: *Lean Project Management: Eight Principles For Success*, BookSurge Publishing, 2006.
- [8] International Project Management Association (IPMA): *The IPMA Individual Competence Baseline 4th Version (ICB4)*, 2015.
- [9] ISO 21500:2012, *Guidance on Project Management*, 2012.
- [10] Hardy-Vallee, B.: *The Cost of Bad Project Management*, (source: <http://www.gallup.com/businessjournal/152429/cost-bad-project-management.aspx>), accessed: 10.4.2017.
- [11] Browning, T. R.: *Value-based product development: refocusing Lean*, Proceedings of the IEEE Engineering Management Society, Albuquerque, NM, 168-172, 2000.
- [12] <http://www.startuplessonslearned.com>, accessed: 10.4.2017.
- [13] Blank, S.: *Why the Lean Start-Up Changes Everything*, Harvard Business Review, 2013.
- [14] Feargal, S. Q.: *Crowning the Customer*, The O'Brien Press, 2012.