

# Applying Customer Development for Software Requirements in a Startup Development Program

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**Abstract**—Startups face a dynamic environment and need to overcome several challenges in order to become successful. One of these challenges is related to the software requirement process. Since the customer is often unknown in a startup, the development team must find a strategy to avoid developing features that will not meet customers needs. This work presents the application of the customer development process for software requirement activities. Our preliminary results indicate that using customer development can help development teams improve their software requirement elicitation processes.

**Keywords**—customer development; startups; software requirements; business modeling; business validation;

## I. INTRODUCTION

Every day new software startups are developed due to a combination of market demand and accessible technology [1]. According to Blank and Dorf [2], the term *software startup* refers to the creation of a software-based company that has not found its business model yet. Thus, it works in a high uncertainty environment. Most startups follow the *lean startup* methodology [3], which combines short software development cycles with constant interaction with potential customers. The goal is to find product/market fit, *i.e.*, develop a product or service that satisfies a given market.

Unfortunately, the majority of the startups do not survive the first two years [1]. Several reasons account for this, such as competition and lack of resources. However, software engineering issues, specially related to requirement processes, are key to this high failure rate [4]. The output of the software requirement process, the software requirements, needs to be validated by the end user and/or the customer [5]. However, in a startup context, users and/or customers are often unknown [3].

One possible alternative to gather software requirements for startups is by using the customer development process [6]. This process is divided into 4 phases: *customer discovery*, *customer validation*, *customer creation* and *company building*. In this sense, this paper presents the application of the customer development process for software requirements in a startup development program, called *Startup Garage*, and its outcomes. We will describe the experience from three startups that went through this process along with the lessons learned.

The remainder of this paper is organized as follows: Section II presents the background on startups, customer development and software requirement process. Section III describes the

program in which the method was applied. Section IV shows the preliminary results and insights. Finally, we draw our conclusion in Section V.

## II. BACKGROUND

As mentioned in the previous section, the uniqueness of a startup requires different development strategies since the market and customers can be unknown. The use of traditional software development methods might not work in this scenario [7]. Therefore, different approaches need to be tested in order to speed up the product/market fit process.

### A. Startups

According to Blank and Dorf [2] a startup is a temporary organization that is searching for a sustainable and repeatable business model. When this organization finds its business model, it is no longer a startup; it is a company. Eric Ries [3] defines a startup as “*a human institution designed to create a new product or service under conditions of extreme uncertainty*”.

Regardless of the definition, startups share similar characteristics [8]: youth and immaturity, limited resources, internal and external pressure, and dynamic technologies and markets. High risk and uncertainty are also present in the life of a startup.

Regarding software development processes for startups, several strategies and approaches have been tested, but not significant results have been achieved [8], [9]. As already mentioned, the most import goal a startup must undertake is to find who the customers/users are as well as the business model that will sustain the company. In order to do so, startups usually build a minimum viable product (MVP) [10]. As soon as the startup presents the MVP to potential users/customers, it begins to collect feedbacks that will help define the next features to be developed [11]. One of the common mistakes with this approach is to understand what “minimal” means [12]. The development of an MVP should focus on the smallest effort in order to test a given assumption of the business model.

### B. Customer Development

Steve Blank [6] proposed and created the customer development process based on the premise that most startups fail from lack of customers, rather than product development issues. In other words, there are several processes to manage product

development, such as the agile methodologies, but there is no process to manage customer development.

The customer development process is divided into four phases (see Fig. 1):

- *Customer Discovery*: state and validate both the problem and the customer hypothesis. It can only move to the next phase once there are evidences that group of customers are willing to pay to solve a given problem.
- *Customer Validation*: develop and test a sales process. If the startup is not able to validate the business model, it has to go back to the discovery phase. This move is called *pivot*.
- *Customer Creation*: once the business model is validated, it is time to grow the customer database in order to validate the business feasibility.
- *Company Building*: put formal management into place and create growth strategies to scale the business.

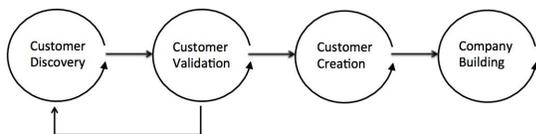


Fig. 1. Customer Development Process [6]

It is important to point out that the first two phases are the most important ones. If the startup is not able to validate its business model before running out of resources, it will fail. Therefore, it is crucial to perform an effective customer discovery process [13]. This can be done by interviewing potencial customers, or by using marketing strategies, such as landing pages or online advertisements to validate a given value proposition.

### C. Software Requirement Process

Sommerville [5] defines requirements as “*descriptions of the system services and constraints that are generated during the requirements engineering process*”. Requirements are gathered from a stakeholder, the person or entity that will use the system. Therefore, the software requirement process is the method that helps finding and defining system requirements.

Software requirements can be described for different target audiences. For instance, user requirements are statements written in natural language describing what the system should do as well as its constraints. System requirements, on the other hand, are more detailed descriptions that show how the system should be implemented [5].

Requirements can be classified into two types:

- *Functional requirements*: describe what the system should and should not do. For instance, in an e-commerce website a functional requirement could be the possibility of filtering products by category.
- *Non-functional requirements*: system constraints, such as waiting time or safety issues. Using the same example (the e-commerce website), a non-functional requirement

could be the maximum waiting time for a give action performed by the user.

Regarding documentation, the software requirements document is used not only to describe how the system should be implemented, but to align expectations between the client and the development team [5]. When requirements change frequently, such as in a startup, best practices tell us to collect requirements incrementally and expressed as user stories. This way, clients can reprioritize requirements after each development cycle [14].

Usually, the requirements engineering process includes five phases [5]:

- Viability study;
- Elicitation and Analysis;
- Especification;
- Validation;
- Management.

Being close to the client during this process is extremely important. A poor requirements engineering process can lead to the development of unsolicited features. The consequence is not only waste of time and money, but it also reduces trust between the client and the development team.

## III. THE PROGRAM

Startup Garage is an innovative program planned and executed at RAIAR<sup>1</sup>, the business incubator located at the PUCRS University Campus, in the south of Brazil. The program, offered to students and researchers at PUCRS, is focused on teaching business validation and modeling. In this program, future entrepreneurs receive constant mentoring as well as access to tools and to networking opportunities. The program helps turning ideas into sustainable business by offering the knowledge and the tools needed to validate business hypotheses.

The program is divided into four main phases: *Self-Knowledge*, *Business Validation*, *Business Model* and *Operational Issues*.

### A. Self-Knowledge

In this phase, entrepreneurs explore self-knowledge and self-awareness. By learning more about themselves, entrepreneurs can improve their strengths and work on their weaknesses. This process explores the person’s values, motivations, beliefs, culture, skills, style, among others. In order to do so, we applied tools, such as the MBTI (Myers Briggs Type Indicator) [15], which are used as resources for evaluation psychological aspects of personality in clinical, educational and organizational areas [16].

### B. Business Validation

Regarding business validation, mentors help entrepreneurs change their mindset from a solution perspective to a problem/customer view. Most participants come to the program with a solution in mind. However, none of them have actually

<sup>1</sup>See more details on <http://www.pucrs.br/raiar>.

validated if the solution solves a problem for a given audience; in fact, they believe their solution works. Therefore, it is crucial to make participants understand that they need to validate the problem first. Here is where the customer development process is introduced. Entrepreneurs must interview potential customers and present the results to their peers. This is the moment where most of the learning happens. Several teams pivot their ideas in order to adapt to customers feedbacks. Once entrepreneurs start learning from their customers, the software requirement process begins to make sense, since the team does not “guess” what to build next; they develop requirements based on actual needs.

### C. Business Model

In the third phase, mentors help the entrepreneurs design and develop their business models. The business model canvas [17] is the tool used for that matter. This tool is very visual and easy to use. The business model canvas is divided in nine blocks that need to be filled out in the right order: *value proposition, customer segments, channels, customer relationships, revenue streams, key resources, key partners, key activities* and *cost structure*.

One of the biggest advantages of using this approach is that it gives the entrepreneur a holist view of his/her business. The nine blocks need to be connected. For instance, once a customer is defined, the channel needs to be such that reaches that specific customer. If one block is invalidated, the business model may fall apart. This is the time where the entrepreneur starts thinking about the business as a whole, and not only in terms of the proposed solution.

### D. Operational Issues

The last phase is focused on several other important aspects related to a business life cycle. For instance, participants learn about legal issues, such as social contracts. Additionally, a social media specialist helps each team to position themselves online. The university’s technology transfer office (TTO) also cooperate in the program by explaining how patents and intellectual property work.

In the very last day of the program, entrepreneurs pitch their ideas to the community. Accelerator representatives, investment fund managers, angel investors, among others are invited not only to watch the presentations, but also to give feedback. Startups that show the best results are invited to join the university incubator to continue the business development.

## IV. RESULTS

In this section, we will describe three startups that have participated in the program from beginning to end. In the context of this paper, we name them *Startup A*, *Startup B* and *Startup C* due to confidentiality issues.

It is worth mentioning that we are presenting the process that made the startups pivot from a business point of view. We are aware that there are several steps that need to be undertaken in order to transform business requirements/needs

into software requirements that are not described in this document.

Data was collected during the program through a semi-structured interview questionnaire. Questions were focused on the experience startups were undergoing during the *Business Validation* phase.

### A. Startup A

*Startup A* members wanted to strengthen the organic food culture due to the increase of diseases associated with poor diet. The solution they brought to the program was a mobile application that would help people improve their knowledge in this field.

During the business validation process, they used the customer development process and identified the need to learn from both producers and consumers. When they interviewed producers, they realized a common problem: *distribution*. Once they have the product ready, they need to activate several channels to sell the products. If it takes too long, it goes to waste.

On the consumer side, there was a clear issue regarding finding good organic stores or markets. In addition, most consumers ended up buying non-organic food in the supermarket due to lack of time.

Therefore, *Startup A* realized the need to connect both the producer to the consumer in such a way that could solve both problems. From this experience, they pivot their idea to a mobile application that would link producers’ goods to consumers not only by exposing and offering the products, but also by delivering them. A month after launching their MVP, *Startup A* was able to make over US\$3,000 in sales.

### B. Startup B

Brazil has over 50 million people in debt, according to government reports. The current crises accounts for this big problem. Hence, *Startup B* entered the program aiming to reduce this figure. The first idea was to develop an online platform in which people could negotiate their debt (individually or collectively) directly with the lender.

Since debt is a very sensitive topic to people, the group decided to create a landing page to test their assumptions (verify if people want to make a simulation), rather than running an interview. This is a very interesting point regarding the customer development process. The startup must be aware of the problem and the customer in order to use the right tool to collect data.

After running this first experiment, they realized there was no interest in running a simulation in the site. Hence, they need a new strategy to go on. On the second experiment, *Startup B* decided to interview financial institutions in order to learn more about the process. They learned that most renegotiations happen on-site, *i.e.*, it is not common to close a deal online or over the phone. In addition, financial institutions already have their own strategy and partners. In short, the group did not feel confident to pursue this business, since no assumption was validated. It is important to point out that this outcome is

not bad. The worst that can happen to a startup is to develop something nobody wants.

### C. Startup C

*Startup C* developed an online investment platform. The goal was to offer not only a better tools for investors, but also intelligence through predictive algorithms. Moreover, they planned to work with modern financial assets, such as bitcoins.

The business validation mentor suggested to validate the customer segment, since the startup was dealing with a lot of new technology. The group conducted interviews and realized they were focusing on the wrong audience. The customer development process showed them there was two main segments:

- *Young man*: 25 years old, single, interested in new technology, low risk investor.
- *Mid-age man*: 40 years old, married, understands about finance, high risk investor.

Before the experiment, *Startup C* had a different view on its customer segment. This new information was key, since it changed the whole software development strategy.

## V. CONCLUSION

Startups need to overcome several challenges in order to become a successful business. Knowing who the customers are and what problems they need to solve is one of the first and most important tasks a startup must undertake.

This work presents one experience of the application of the customer development process to gather software requirements. We have analyzed data from three startups that participated in a startup development program. Although not conclusive due to lack of data, there is an indication that this process can help teams understand customers needs, hence, improving the software requirement process.

As future work, we intend to apply this method to a significant number of startups in order to collect more information about the process. The main goal is to find a pattern that can really help startups gather software requirements more efficiently.

## REFERENCES

- [1] C. Giardino, N. Paternoster, M. Unterkalmsteiner, T. Gorschek, and P. Abrahamsson, "Software development in startup companies: The greenfield startup model," *IEEE Transactions on Software Engineering*, vol. 42, no. 6, pp. 585–604, June 2016.
- [2] S. Blank and B. Dorf, *The Startup Owner's Manual: The Step-by-step Guide for Building a Great Company*. K&S Ranch, Incorporated, 2012.
- [3] E. Ries, *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*. Crown Business, 2011.
- [4] M. Kajko-Mattsson and N. Nikitina, "From knowing nothing to knowing a little: Experiences gained from process improvement in a startup company," in *Computer Science and Software Engineering, 2008 International Conference on*, vol. 2, Dec 2008, pp. 617–621.
- [5] I. Sommerville, *Software Engineering*, 9th ed. USA: Addison-Wesley Publishing Company, 2010.
- [6] S. Blank, *The Four Steps to the Epiphany: Successful Strategies for Products That Win*. K&S Ranch, Incorporated, 2013.
- [7] G. Coleman, "An empirical study of software process in practice," in *Proceedings of the 38th Annual Hawaii International Conference on System Sciences*, Jan 2005, pp. 315c–315c.
- [8] S. M. Sutton, "The role of process in software start-up," *IEEE Software*, vol. 17, no. 4, pp. 33–39, Jul 2000.
- [9] G. Coleman and R. O'Connor, "An investigation into software development process formation in software startups," *Journal of Enterprise Information Management*, vol. 21, no. 6, pp. 633–648, 2008.
- [10] S.-C. Li, "The role of value proposition and value co-production in new internet startups: How new venture e-businesses achieve competitive advantage," in *Portland Intl Center for Management of Engineering and Technology (PICMET)*, 2007, pp. 1126–1132.
- [11] C. Giardino, X. Wang, and P. Abrahamsson, *Why Early-Stage Software Startups Fail: A Behavioral Framework*. Cham: Springer International Publishing, 2014, pp. 27–41.
- [12] V. Lenarduzzi and D. Taibi, "Mvp explained: A systematic mapping study on the definitions of minimal viable product," in *2016 42th Euromicro Conference on Software Engineering and Advanced Applications (SEAA)*, Aug 2016, pp. 112–119.
- [13] T. Batova, D. Clark, and D. Card, "Challenges of lean customer discovery as invention," in *2016 IEEE International Professional Communication Conference (IPCC)*, Oct 2016, pp. 1–5.
- [14] K. Beck, "Embracing change with extreme programming," *Computer*, vol. 32, no. 10, pp. 70–77, Oct. 1999. [Online]. Available: <http://dx.doi.org/10.1109/2.796139>
- [15] M. H. Mccauley, "The myers-briggs type indicator: A measure for individuals," *Measurement and Evaluation in Counseling and Development*, vol. 22, no. 4, pp. 181–195, Jan 1990.
- [16] R. P. Brzozowski, *Psychological type of the individual entrepreneur: A study of the predominant psychological type in entrepreneurs, according to the MBTI*. Campo Limpo Paulista: FACCAMP, 2011.
- [17] A. Osterwalder and Y. Pigneur, *Business model generation: a handbook for visionaries, game changers, and challengers*. John Wiley & Sons, 2010.