

## Lean Startup applied in Healthcare: A viable methodology for continuous improvement in the development of new products and services

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**Abstract:** The main objective of this research was to present the hypothesis of using Lean Startup in the healthcare segment as a way of improving the process of creation and development of new products and services in the industry. We performed a literature review on Startup, Lean, Lean Healthcare and Lean Startup. The research was characterized as exploratory, bringing a case of using the Lean Startup by the U.S. government.

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### 1. INTRODUCTION

This article will present the Lean Startup approach (Ries, 2012) in the healthcare segment demonstrating the hypothesis of a possible alternative to the agile and assertive new companies and / or businesses in this sector. The objective of this study is to explore the hypothesis of the applicability of Lean Startup in the healthcare segment. For this we define the concept of Lean Startup and Startup, check which segments using this approach and present the possibility of application of Lean Startup in healthcare segment.

According to the survey, the topic is relevant because use a tool that improves the process of innovation and application of new technologies in healthcare is essential so you do not waste money (which is for the most part public) and earn up time (so a new healing technology can get faster to patients).

The pressure and velocity of business change in this twenty-first century makes all types of organizations (from small businesses to large corporations, public or private) need to use new management and production to rapidly innovate and keep pace with the market. Due to these factors the Lean Startup methodology is already applied in large companies such as General Electric, Qualcomm and Intuit (BLANCK, 2013).

In 2011, the U.S. National Science Foundation began using lean methods to market their basic scientific research in a program called Innovation Corps. Eleven universities now teach lean methods for hundreds of teams of senior scientists in the United States (BLANCK, 2013, p. 8).

### 2 .LITERATURE REVIEW

To talk about the Lean Startup healthcare segment is important to understand what is Lean Startup and Lean approach.

Startup is therefore, according to Acs and Amorós (2008), "the process of creating a fledgling business", ie, in this case any company in the process of launching the business would be considered a "Startup".

Other researchers disagree Acs and Amorós Startup and set, according to the age of the company, considering from a newly formed company to one with 08 or 10 years (Hayton, 2002; Lussier, 1995 cited by Brigidi, 2009).

Hisrich and Peters (1998) cited by Brigidi, (2009), go beyond the definition and "identify phases as Startup, early growth, rapid growth and maturity." When addressing high technology Hanks, Watson and Chandler (1993) also cited by Brigidi, "identify the stages of startup as expansion and diversification early maturity."

Already Elfring and Hulsink (2007) cited by Brigidi (2009) deal Startups from their categories: independent, spin-offs and incubated. Startups are independent companies that start their businesses on their own, "alone", Spin-offs is the union of two or more Startups working on different activities that unite to meet the same market and are incubated to start their businesses within a nonprofit organization that aims to monitor and develop the Startup. In Brazil there are incubators that are maintained by Government or Universities Business Institutions such as SEBRAE (SEBRAE, 2012).

Contributing to these categories, Shrader and Simon(1997) cited by Brigidi 2009, p. 64 define Startups from its founding agent, so we have to "Startup Initiative Corporation regards those companies that emerge as a new business from another parent company, which is its parent and sponsor and the independent Startup Initiative, which refer companies business initiated by independent entrepreneurs without the aid of a parent company".

Synthesizing the concept of Startup, Ries (2012) have defined as an "institution designed to create new products and services under conditions of extreme uncertainty", inside or outside of a large company.

This condition of uncertainty is common in high-tech, as stated Brigidi (2009) mainly due to competition and frequent change of technology, making constant developing new products in this type of venture. Among many other high-tech ventures, are also included in the segments of biotechnology, pharmaceutical and medical according to OECD (Organization for Economic Co-operation and Development) (2005).

Ries (2012) complements his definition by saying that the main goal of a startup is to find the right thing to create, ie, what customers want and will pay to have it, as soon as possible and without waste.

The reduction of lead time and waste disposal are driven by the lean approach, which according Womack (1996), Ohno (1997), Liker (2009), is a management philosophy focused on adding value, improving quality of products and services through the reduction of the eight types of waste, which are: overproduction, waiting time, transportation, over processing, inventory, motion, defects and the lack of use of people's creativity.

The main objective of the lean philosophy is therefore to reduce the costs of a company to the fullest - extinguishing any and all types of waste - and increase profitability - offering more value to the products and services developed.

Based on lean manufacturing, has developed the Lean Thinking - Lean Thinking, which according Murman E. (2002) is a dynamic knowledge-based and customer-focused process through which all people in a defined company continuously eliminate waste with the aim of creating value.

Within this philosophy, researchers and scholars have come to understand that lean thinking can be used in any segment of the industry, trade and / or service.

Thus, in medicine we have Lean Healthcare, for the purpose of enhancing the patients and staff, increasing the quality and minimizing waste (liker, JK; HOSEUS, M., 2009; MURMAN, E., et al. 2002).

Finally we come up to the study of Lean Startup which is an approach that seeks to eliminate the waste of time and resources spent on the effort of trying to understand what customers really want. The Lean Startup task is to find "a synthesis between the company's vision and what customers

would accept, no surrender to what customers think they want, or tell customers what they should want" (Ries, 2012).

Studies on the Lean Startup by Eric Ries, Hart (2012) states that the "use of the term is consistent with the Lean management philosophy of the Toyota Production System and in this context is an approach that strives to minimize the expense of appeal anything else other than creating value for the customer".

Thinking that the Lean Startup approach is more widely used in high-tech and that includes the healthcare segment, we can use this approach for the development of new products, services and technologies in this segment.

Even because, for example, De Paula (2006) states that the "product development is critical in technology-based small and medium-sized sector of medical equipment".

The thought of Ries meets the 02 first principles that comprise the model system Lean Product Development cited by Morgan and Liker (2008), which are "to identify the value set by the client to separate value from waste and concentrate early in the product development process to fully explore alternatives while there is maximum design flexibility".

Thus, Ries, 2012, p. 07-08 points out the five principles of Lean Startup:

"Entrepreneurs are everywhere [...]; undertake is to manage [...]; validated learning [...] - startups exist to learn how to develop a sustainable business and this learning can be validated scientifically [...] , build-measure-learn [...] - turn ideas into products, measure how customers react and learn from them [...] and accounting for innovation [...] - measuring progress, defining milestones and prioritize works [...]".

Among the five principles of Lean Startup, what most caught our attention is the tripod "build, measure and learn - turning ideas into products, creating something for the customers, measure your results with clients, learn from customer feedback and recreate from what we learned".

This tripod is very similar to the PDCA (Plan, Do, Check and Action), which is a known method and used for maintenance, improvement and innovation products, services and processes and converge in two ways: in performing successive changes in operational processes or administrative, with successive gains obtained without investment, incremental and continuous improvement of an activity to create more value with less resource-consuming activities, also known in the business as Kaizen or continuous improvement, the second form convergence of PDCA is the act of designing a new process to achieve the desired goal or making substantial changes to existing processes, this is called Kaikaku, which lead to great advances radical improvement and new investments (Calado, 2010). Below the chart showing PDCA cycle correlation with the Lean Startup methodology.

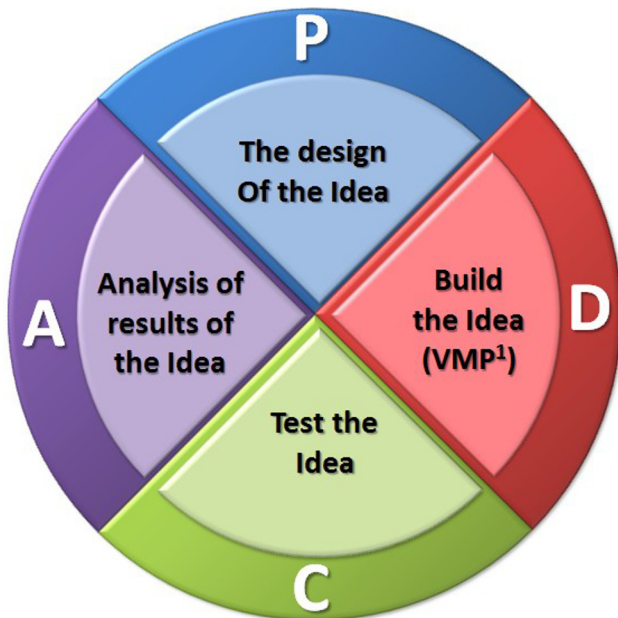


Fig 1: contraposition of the PDCA cycle with Lean Startup

(1 VMP - Minimum Viable Product - product prototype that aims to understand what the client's expectations against the product).

Despite the development of new products and services is encouraging, making it happen is challenging. Thus, one cannot expect that the design for new products or services appear finished, it is actually necessary to test various ideas and concepts until they set the general concept to pursue (Slack, 2009).

The Lean Startup approach relates exactly to this stage of development of a product, as can be seen in the following figure:

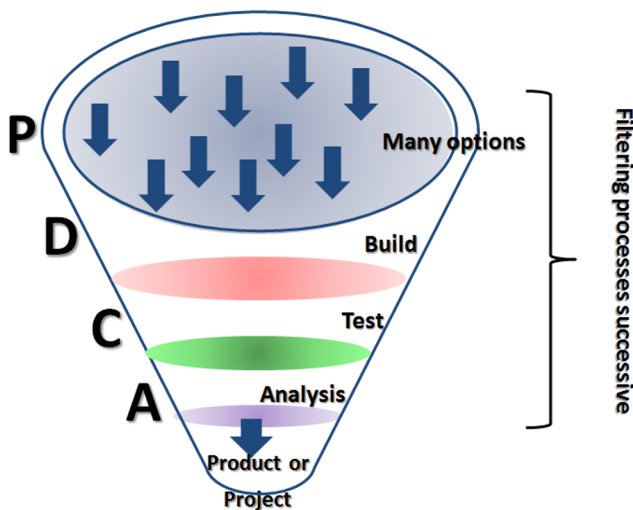


Fig 2: Using Lean Startup processes successive filtering of ideas for the design of new products or services (based on Slack, 2009).

Plan with the client is important because a modern company should be customer oriented, have it on top of your business model to generate competitive advantage, as stated by Kotler

and Keller, 2006. In order to effectively get this advantage is necessary to understand what the customer search for your product / service.

Thus, for example, medical client may be a patient, a physician or entity paying for services

Amaral et al, 2006 list all management factors that affect the performance of new product development (PDP), and among them mentions the involvement of the customer chain, saying that his involvement improves product conceptualization to customer needs.

To SANCHES and PÉREZ, 2003 cited by De Paula, 2006 pag. 28 "The critical success factors in the PDP are variables that enable companies to minimize the development time of a new product, creating competitive advantages and larger market shares," a concept similar to what Ries, 2012 puts the main task of the Lean Startup.

Still supporting Ries, 2012 Brigidi, 2009, p. 63 states that "[...] at Startups companies [...] knowledge is especially important for your success [...]."

Knowledge is a resource as important as the financial resource for a startup and the absence of any feature can limit the growth of this (PENROSE, 1959, Barney, 1991; WERNERFELDT 1984 cited by Brigidi, 2009). Companies with limited resources may be vulnerable and to have a greater predisposition to failure (VAN COMES; HUDSON; SCHROEDER, 1984, 1965 cited by Brigidit Stinchcombe, 2009).

Seeking to minimize this possibility, Ries, 2012 insists that every startup should always work within the cycle build, measure, and learn, learn to be the most important part of the process, since it allows the entrepreneur to rebuild your project / product more assertive and as expected by the client.

Being a business segment of healthcare as innovative as those who are in Silicon Valley, the Lean Startup methodology will serve to decrease the critical factors and the uncertainty that exists in the process of creating a new product / service or business in this sector.

To use the Lean Startup entrepreneurs need to first know what your goal, "where he intends to reach." In sequence to identify the actual need of the customer by testing the market with minimum viable products that must be manufactured complying with the method lean, that is, without waste, this test may be comparison between two products when the minimum viable test is all assumptions together; trial if the client tells his experience of using the product or service or test every improvement made.

For the analysis of the results it is necessary to use the tools of science and statistics, and ensures the reliability of the results. This is because this test will show if the company is on the path of success - is moving towards its goals - or failure, if they are contrary to what was intended.

When the results are positive, the entrepreneur must consider what will be its growth engine, which will make your business grow sustainably, noting that all products and

services have a life cycle and therefore innovation processes must be continuous in the company.

But when the results are negative will be deciding between pivot design, or restart it or give it up. This decision is not simple, so it should be taken along with the staff of the company, employees, managers, sponsors and investors.

### 3. RESEARCH METHOD

To prepare this article a survey was conducted theoretical / conceptual, which according to Miguel, 2012 p. 67 "are conceptual discussions from literature, literature reviews and conceptual modeling".

The purpose of this article is to open the field of discussion about lean startup facing the healthcare segment, was used for both research literature on lean lean startup and other approaches, and it was used in other literature reviews, such as articles in U.S. government sites.

The research on the topic is beginning, so there is not yet final on the topic of analysis, but through the records, you can raise some important hypotheses for further study.

Thus, first we attempted to theory in books and articles related to the lean approach, after a systematic reading of these were found positive examples of the use of lean startup and hypotheses are used as a result of this article.

In research on the basis of national and international data: webofscience, ScienceDirect, onlinelibrary and capes from January 1994 to March 2013, it was realized a growth of 500% of the studies of Lean in healthcare (searched with the term "Lean Healthcare "). Publications on Lean healthcare appear bases surveyed from 2008 and gained momentum in 2011, according to information obtained in the survey. To Lean Startup met two articles of 2013, and another one in online library in Harvard magazine. Importantly, there are no studies specific to Lean Startup healthcare but studies on the importance of making this segment lean.

### 4. LEAN STARTUP APPLICATION

To present this new approach Lean, there are several examples of its applicability in high-tech companies in the software industry and games. But to demystify the idea of Startup and prove that the Lean Startup approach can be used in any segment will be presented as an example what happened in the United States in the creation of a new ministry.

For this it uses part of an article published on the website of Government Technology August 23, 2012, which was written by Justine Brown, whose original title is "Governments Take the Lean Startup Approach".

[...] The U.S. government requested transparency and open government, calling for a government more participatory, drawing on the experience of the American people, to address the major challenges facing the country. Later, was issued an executive order for federal agencies to streamline service delivery and improve customer service.

Observing the dramatic advances in customer service by other sectors, the executive order challenged federal agencies to "improve the experience of customer service, especially through the effective use of technology and innovation."

With these and other new policies, paving the way for a new approach to the way the federal government does business, all that was needed was a chance to put them into play. That opportunity came in July 2010 when it created the Dodd-Frank Wall Street Reform and Consumer Protection Act.

Among other things, the law mandated the creation of a new federal agency, the Consumer Financial Protection Bureau (CFPB) and the Office of Consumer Financial Protection (in a free translation), which would be tasked with protecting American citizens from predatory lending by financial services companies.

Recognizing the opportunity, the U.S. government calls for the development of some innovative approaches.

[...] For this, they began to see the CFPB as a Startup, and examined how the Lean Startup principles could be applied and used to make the agency more efficient and profitable. "Some of the principles include treating the new venture as an experiment, identifying the elements of the plan that are not facts and assumptions, and find ways to test them," said Ries. "Basically, the idea was to build a minimum viable product and have the agency operating on a smaller scale long before the official plan was set in motion. After all, once an agency is working with a budget of \$ 500 million and a great team, changing the plan would be very consuming and wasting time. "

[...] Applying Lean Startup principles, the agency developed a site called "Know Before You Owe", which offered a dynamic and simple to generate data on what worked and what did not. The site launched in May 2011, two prototype designs accessible online. The audience was then asked to try out the site and provide feedback.

The Lean Startup approach was also applied in the development of the site healthcare.gov, which was released in just 90 days and at a fraction of the cost that the federal government often spent on such projects.

Ries (2012) implements the Lean Startup approach to healthcare.gov site and describes the benefits. "In user testing and feedback stage, they found that the information that people were looking for were very different from what they expected seek," he said. For example, healthcare care companies are not legally required in the United States, to disclose certain information about their plans, but Ries said that, based on surveys of citizens, these data proved to be extremely important. "There was no regulatory power to require companies to provide such data, but once it became clear how important it was for citizens, a lever had to go to the insurance companies and push the issue."

[...] The federal government can point to several achievements, using Lean Startup principles, but other levels of government can also apply them successfully?

[...] In the end, Ries (2012) states that success with the Lean Startup approach is less about what kind of organization

you're in and more about how you approach the problem is in your hand. "It's about discovering how to make resources available, how to structure the team, what metrics will be used, etc."

Although these elements do not guarantee success, he said, the lack of them guarantees failure. "Think big, start fast, small scale and be flexible," said Ries.

## 5. CONCLUSION

The Lean Startup is a new approach and wipes the process of developing new technologies and / or new business, causing it to reach faster, more efficiently and effectively to customer needs.

Sectors that have been applied, the Lean Startup accelerated the consolidation of the company or product in the market, so to increase the financial assets and reduce the lead time of product development, and has shown to entrepreneurs in a short time if the new business will get return or not.

As shown in the case, this approach is already being used by corporate America and its government with good results. We also saw their applicability in healthcare with the creation of a website where customers can check on the existing healthcare plans (it is known that the United States public healthcare is not as in Brazil) and the feedback of this the government has better able to work with insurance companies, and give positive feedback to the whole population.

Still thinking in the healthcare industry, the implementation of the Lean Startup directly in hospitals, clinics, pharmaceutical companies, among others will be a great benefit for all patients (who will be receiving the "new" faster and better) and hospitals that can respond more efficiently and effectively the customers.

The hypothesis presented in the article is validated towards this segment and will be widely studied and validated throughout the dissertation of this author.

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