

Development and implementation of a model to support the validation of new business ideas

Durães, L¹, Afonso, P², Colla, J³, Ferreira, A⁴

Abstract This paper focused on the development and implementation of a model to support the validation of business ideas supported by new technology-based products or services based on the Design Thinking, Lean Startup and Business Model Design approaches and on processes that take place in four stages of validation: value proposition, market, business model and financial-economic. The different approaches and all validations are considered important, and act in an interdependent and complementary manner. Academic literature is still scarce regarding the interconnection between these approaches, and in practice there are significant gaps in the operationalization of effective and efficient processes, that enable the transformation of ideas into new businesses. The model developed was analyzed using a case study focused on the MobiBUS project, developed at Bosch Car Multimedia that aims the improvement of the service quality provided by public transport companies. Thus, it was possible to apply different approaches throughout the four stages of validation, since the product under development was in the design phase. As a result, it is important to highlight the importance that the three approaches represent for the validation of business ideas and that their interconnection throughout the four stages promotes communication and guides the team from the ideation to the moment before the product is ready to be launched on the market. On the other hand, the use of validation moments, between stages, and the use of deliverables fostered better decision making.

Keywords: Design Thinking, Lean Startup, Business Model, Innovation, New Product Development.

1 Introduction

Nowadays, companies are facing a highly dynamic environment not only due to the increasing customer demands, but also due to the competition from cheap labor countries, shorter product life cycles, and disruptive innovations. Consequently, and to avoid being overtaken by competitors, companies are promoting a constant reinvention of products, services, and business.

In this context, it is through innovation, Pisano and Teece (2007) as technical knowledge on how to do things better than the current state of the art, that organizations find the competitive advantages capable of ensuring business success. Thus, to overcome this competition, companies are willing to forsake the traditional systems of innovation and focus on new methods where prevails the dialogue between consumer and business, access to information, transparency between both parties, as well as a clear understanding of the associated risks and benefits (Prahalad & Ramaswamy, 2004). However, although innovation could be a trigger for growth, profit and increased competitive advantage, it also incorporates high risks and there is no guarantee that it will outweigh the effort required (Pisano & Teece, 2007).

¹Luís Miguel Pires Durães (e-mail: a74790@alunos.uminho.pt)
Algoritmi Research Center. University of Minho, 4804-533 Guimarães, Portugal

²Paulo Sérgio Lima Pereira Afonso (e-mail: psafonso@dps.uminho.pt)
Dpto. of Production and Systems. School of Engineering. University of Minho, 4804-533 Guimarães, Portugal.

³Julio Ernesto Colla (✉ e-mail: julio.colla@unespar.edu.br)
Dpto. of Administration. State University of Paraná, Paranavai, 87703-000, Brazil.

⁴André Leite Ferreira (e-mail: alferreira@di.uminho.pt)
Dpto. of Informatics. School of Engineering. University of Minho, 4710-057 Braga, Portugal.

In other words, investment in innovation may not result in marketable products and even when it does, such products may not fit satisfactorily to the market, company's business model, the expectations of financial return, or the profit required by all stakeholders. For example, the use of the co-creation approach, where the client is integrated into the development process, ensures that the solutions encompass the adequate characteristics and functionalities for the underlying problem and needs (Pralhad & Ramaswamy, 2004; Wikström, 1996).

This new perspective of developing new products, called open innovation, where organizations should use internal and external ideas, and try different paths to market at the same time they seek to develop their technology, has changed the business paradigm (Chesbrough, 2006). This way, companies have started to give the same importance to the business model as they give to value creation because one single product can be included in several business models and generate different revenues, and it is important to choose the most appropriate (Teece, 2010).

As suggested for Afonso and Fernandes (2018) any innovative product or service may go through a process of validation of the value proposition, the market, the business model and the economical-financial viability. For this reason, it is essential to develop and apply a validation methodology that addresses the context of each organization, helping them to evaluate ideas for new business at an early stage, in order to reduce the risks of investing in unviable projects. As stated, the fact that most innovations fail when exposed to market pressures suggests that companies still have difficulties in finding the best method of evaluating the potential success of a business idea, which would enable the identification of future problems and the reduction of investment risk in a non-viable project.

The theoretical basis of this article is grounded on the use of methodologies such as Design Thinking, Lean Startup and Business Model Conception as these strategies have numerous benefits when used at different stages of innovation. In a paper, Mueller and K. Thoring (2012) was concluded that even using similar techniques and methods, it was not common for the Lean Startup and Design Thinking communities to interact with each other and quote the authors from the other community. Therefore, based on the premise that both strategies could benefit from each other, they suggested the "Lean Design Thinking" model.

In the same conference where the previous model was published, (Grossman-kahn & Rolsensweig, 2012) published a paper recommending the use of a model. The authors argue that at the heart of all three approaches is an iterative mindset, a focus on customer needs, and a trend towards rapid experimentation, prototyping and testing.

Alternatively, Ghezzi, Rangone, and Balocco (2015) studied the potential contribution of Business Model Design and Lean Startup to both the theory and practice of strategic entrepreneurship. From the results obtained it is possible to conclude that companies that used both strategies achieved better results compared to those that used only the formulation of a business plan.

Intending to help the development of user-centric software, was proposed for Ximenes, Alves and Araújo (2015) a model called "Converge", which combines Lean Startup, Design Thinking and Agile Methodologies. According to the authors, the tests performed indicate that it is possible and productive to combine the different methodologies because the model presents good results in the guidance of software development projects. Additionally, in an attempt to offer new knowledge on how startups could benefit from the combination of different software development approaches, Paula and Araújo (2016) have refined the Nordstrom's model. The authors stated that future work should explore/identify which tools should be used to support the teams in the process of developing new products or services.

More recently, Reis, Fleury and Carvalho (2019) stated that the latest startups successes have resulted in a growing interest in entrepreneurial approaches. The authors investigated how entrepreneurs apply new methodologies to create a new business, identifying the most important phases and activities. In short, it is possible to see that the idea of combining several strategies such as Design Thinking, Lean Startup, Business Model Design and Agile Methodologies have been the subject of some research in recent years.

Thus, this article aims to develop, through a case study, a model that incorporates different approaches throughout a validation process. This way emerges the need to understand how we can integrate the different innovation approaches in a process that is developed in different stages and moments of validation. In addition, it is important to understand how each approach can contribute to the different stages, what is its predominance and when they should work alone or jointly.

This article assumes that knowledge of reality will be the result of the interaction between the researcher and the social actors that integrate the object of analysis, during the research process. As a research strategy, the case study was chosen as this approach should be applied to a specific phenomenon, a specific event, a process or a specific institution Merriam (1988). Also, the case study is appropriate to answer questions such as "why?" and "how?" (Yin, 2009; Merriam, 1988).

The case study was represented by the MobiBUS project that aims to develop two technological solutions to improve the public transport system, namely buses. This choice was because the project was at an early stage of ideation, which would enable the validation of the business idea through all stages of the validation model.

Such investigation procedures followed a set of pre-established steps, namely: (a) conceptual framework: in this phase, the most relevant theoretical concepts on which this research was based were identified through research and review of the existing literature; (b) model conception: this phase aimed the development of a model supported by the current state of the art of Design Thinking, Lean Startup and Business Model Design. In this stage a score of the relationship between the model of the four validations and the pillars and strategies of innovation was established by the researchers; and (c) analysis of the applicability of the model: the model obtained was studied through the analysis of a case study.

This way, the applicability of the model was studied, potential incoherencies were corrected, and future improvements were suggested.

2 Combining Design Thinking, Lean Startup and Business Model Design

This section is composed of three complementary subsections that discuss the theoretical logic that support the multidisciplinary approach proposed in this article. It is highlighted the relationship between the three pillars and the innovation strategies on the one hand (desirability, feasibility and viability) and, on the other hand, the four validations model (value proposition, market analysis, business model design and economic-financial validation). The first section presents the relationship between the 3 pillars of innovation and the four validations model, the second section shows the relationship between the four validations model and the innovation strategies and the last one discusses the validation cycles.

2.1 Relationship between the three pillars of innovation and the four validations model

Adopting the perspective of a successful business must be based on three pillars, namely, desirability, feasibility and viability (Brown and Katz, 2009). "Desirability" refers to the desire for a certain solution, i.e. it represents the relevant stakeholders of the business and their needs. "Feasibility" represents what is functionally possible in the near future, i.e. the (concrete) products or services that meet people's needs and expectations. "Viability" represents what is likely to become part of a sustainable business, i.e. it refers to the logic of how a business can generate profit.

Thus, it is necessary to take into consideration the respective pillars during a logical sequence that allows the (in)validation of an innovation project. In this way, the use of a four-stage sequence (Afonso & Fernandes, 2018), namely value proposition, market analysis, business model design and economical-financial validation, proves to be an interesting strategy, since it addresses the three pillars of innovation, Table 1.

Table 1. Relationship between the three pillars of innovation and the four validations model.

	Desirability	Feasibility	Viability	Σ
Value Proposition	3	3	0	6
Market	3	0	1	4
Business Model	0	3	3	6

Economical-Financial	0	0	3	3
Σ	6	6	7	

In more detail, the objectives of each of the validation stages of the business model are: (1) Value Proposition: At this stage the problems/needs to be solved must be identified and validated (Desirability), and the first prototypes must be idealized (Feasibility); (2) Market: At this stage, the interest that the solution will trigger in the market must be validated (Desirability). Moreover, the size and restrictions of the target segments must be identified; (3) Business Model: This stage aims to describe how the idealized value will be generated and delivered to the market segments previously defined. Thus, this stage validates the entire business architecture (Feasibility) and presents some initial indicators of the business viability; (4) Economic-Financial: In this stage, the structure of costs and revenues, the funding options and the profitability of the project (Viability) must be explored and validated (Brown and Katz, 2009; Afonso & Fernandes, 2018).

Additionally, it is possible to understand that the value proposition and business model stages contribute to two pillars of innovation (Desirability and Feasibility), while the market analysis and economic-financial validation stages are more specific to one pillar (Viability). Furthermore, despite the differences between the contributions of each stage, the pillars have practically the same score.

2.2 Relationship between the four validations model and innovation strategies

There is a relationship between the four validation stages and the innovation strategies (Brown & Katz, 2009; Reis, Fleury & Carvalho, 2019; Ximenes, Alves & Araújo, 2015) referred in the previous section, represented in Table 2. An innovation team should use the different tools/techniques proposed by the different strategies and apply them throughout the various stages of innovation for the collection, processing, and analysis of information.

In particular, the use of Design Thinking techniques should be practiced in the first and second validation because in these steps the team needs to find out what the users' needs are, identify the problems and propose solutions. On the other hand, the Lean Startup strategy will allow the gathering of information regarding the market through the Customer Development, as well as the improvement of the solution designed after the application of Design Thinking through the build-measure-learn cycle. This way, its application should be focused on the second and third validation. Finally, the Business Model Design will allow the representation of the entire business architecture as well as the exposure of some considerations related to cost and revenue structure. Thus, its application should focus on the third and fourth validations.

Table 2. Relationship between the four validations model and innovation strategies.

	Design Thinking	Lean Startup	Business Model Design	Σ
Value Proposition	3	3	1	7
Market	2	2	1	5
Business Model	1	2	3	6
Economical-Financial	0	1	3	4
Σ	6	8	8	

By analyzing the table, we can see that the Lean Startup strategy and Business Model Design have a greater contribution than Design Thinking. Additionally, we can see that the stage of the business model and value proposition are the ones that can most benefit from the different strategies. The Design Thinking, the Lean Startup and the design of the Business Model contribute together to the validation of business ideas, since they complement each other.

2.3 Validation cycles

A large part innovation project must go through a validation process (Afonso & Fernandes, 2018) at the end of each stage, as represented in Fig. 1. At this point, the work performed throughout each step is analyzed and questioned by one or more decision-makers. As a result, the model will present an iterative sequence, allowing the repetition of stages if new learnings suggest the need for change.

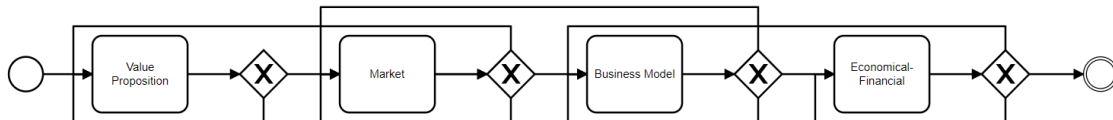


Fig. 1. Representation of stages and validation cycles.

It should be noted that as we move to the right, the cycles should become less repetitive and the validation moments more rigorous. In other words, innovation teams should have greater freedom to generate ideas and test them with the target audience. In this way, the team could easily, and without a lot of bureaucracy, adapt the solution to the market needs. However, as we move into the final stages of the model it is necessary to reverse the roles, that is, we should reduce the repetition of the cycles as much as possible and increase the accuracy of the validation moments because this is a critical phase for the future success of the business.

It can also be concluded that the use of these validation moments allowed the detection of failures at initial/intermediate moments of the project, increasing control and better decision making. The main words in all headings (even run-in headings) begin with a capital letter. Articles, conjunctions and prepositions are the only words which should begin with a lower-case letter.

3 The Four Validations Model

The purpose of the methodology developed in this study is to guide innovation teams in the design and validation of business ideas. Thus, a set of tools is provided to guide the user through the innovation process. A series of collection, analysis and evaluation activities are carried out during the process. These activities can sometimes become time-consuming and complex, requiring research and data organisation in a format that can be effectively understood and used in the following phases of the methodology.

3.1 Value Proposition

Throughout this stage the development team should investigate a potential business opportunity by exploring a particular problem. In this way, new ideas will be generated through the investigation of unresolved problems. For this, it is necessary to follow a set of activities, represented in Table 3.

Table 3. List of Activities – Stage 1.

Activity	Strategy	Output
Identification of the problem	Design	Challenges
Application of qualitative research methods	Thinking	Observed Facts (Texts, Photos, and Videos)
Identification of needs		
Storytelling		Insights
Grouping		Grouped insights
Synthesizing		Personas, User maps, Scenarios

Brainstorming		Ideas
Grouping ideas		Grouped Ideas
Selection		Final idea
Build		
Measure	Lean Startup	Prototype
Prototype		

From the analysis of Table 3, it is possible to see that after the identification of the problem the team should start searching for the root cause of the problem. Then, the team must identify, group, and synthesize the main insights of the observed facts. With this, a process of idea generation begins, from which the most appropriate idea to the situation under analysis should be selected. Then, the cycle build-measure-learn is used until an appropriate prototype is obtained for the problem and the client's needs. Finally, the validation test is carried out. At this point, both the product owner, and the client must analyze the desirability and feasibility of the prototype.

3.2 Market Analysis

In stage 2 the team should identify the target markets and all their implications as well as possible improvements to the value proposition. Thus, the team should carry out the activities, represented in Table 4, to ensure that at the end of this stage there is sufficient information for a decision regarding the potential to scale the business.

Table 4. List of Activities – Stage 2

Activity	Strategy	Output
Segmentation	Lean Startup	Deliverable
Identification of size		
Definition of the geographical area		
Estimation of growth		
Macro analysis of the environment	Business Model	PESTEL, Value chain map
Product comparison	Generation	Deliverable
Identification of strengths and weaknesses		
Grouping ideas	Lean Startup	Results, List of actions
Collection of data		
Analysis of data		
Definition of actions		

Thus, through the segmentation the team should identify a target market and estimate a possible annual growth. Then it is necessary to analyse external factors that can influence the business, such as political, and environmental. Also, it is important to identify the competition, compare its functionalities, analyse its strengths and weaknesses, as well as understand the current state of the industry in which the business is placed.

The team should understand if there is a need to conduct market research to explore any specific aspect that may be critical to the business. Finally, a validation test is performed, where the team must evaluate its value proposition by doing the ten questions test, from Merriam (1988), and then the product owner must analyse the desirability and viability of the business.

3.3 Business Model Design

The stage 3 of the process is responsible for the definition of the architecture of the business. It encompasses all the business phases from the description of how the value will be generated to how it will be delivered. Table 5 shows the activities to be performed during stage 3.

Table 5. List of Activities – Stage 3

Activity	Strategy	Output
Briefing	Business Model Generation	Deliverable
Preliminary ideas testing		
Generation of hypotheses		
Examination of the environment		
Studying potential clients	Lean Startup	Deliverable
Interviewing experts		
Investigating what has already been done		
Grouping ideas and opinions	Business Model Generation	
Brainstorming	Design Thinking	Deliverable
Prototype	Lean Startup, Business Model	
Testing	Generation	
Selection		

The first activities have as main objective the contextualization of the whole team that will be part of the Business Model Conception. After that, the environment, customers, specialists, and the past of the industry are studied. Then, the design of the business model starts, based on the information obtained. Finally, a validation test is performed, and the team evaluates each constituent block of the business model, and the product owner analyses the feasibility and viability of the business.

3.4 Economic and Financial Evaluation

The team's main objective in stage 4 (Table 6) is to calculate the business viability. For this, it should be estimated all the costs and the possible revenues associated with the selected business model. Subsequently, the team must analyse the funding possibilities that best fit the business.

Table 6. List of Activities – Stage 4

Activity	Strategy	Output
Estimation of costs	Business Model Generation	Deliverable
Estimation of revenues		
Funding Analysis		

Finally, the team must perform an analysis of the principal economic and financial indicators of a project, and the product owner must evaluate the viability of the business. It is important to mention that the reference to tools and techniques is not extensive because it does not aim to limit the choice and use of other potentially useful options. Furthermore, it does not matter at which stage of the model a project is at, since all the previous activities could be overcome if the validation tests were positive.

4 Conclusions

The research carried out aimed at developing a model that would combine different innovation approaches over different stages, as well as the use of a case study to analyze the applicability of the proposed model. Consequently, emerged the need to understand how these approaches could contribute to the different stages, what was their predominance within each stage, and when they should work alone or together. For this purpose, a literature review related to the main approaches of innovation and product development, namely, Design Thinking, Lean Startup, Business Model Conception, was carried out. It was proven that information regarding the combination of different approaches was scarce. In this section was important to mention that the reference to tools and techniques is not extensive because it does not aim to limit the choice and use of other potentially useful options. Furthermore, it does not matter at which stage of the model a project is at, since all the previous activities could be overcome if the validation tests were positive.

As main results, it was found that the suggested model makes sense in practice and that the four stages suggested address the three pillars of innovation. Additionally, it was observed that the use of deliverables allowed the team to guide and manage efforts in the production of essential content for the validation of business ideas, which improved the whole process of product development. For example, it was found that the model encourages teamwork, increase the speed of value creation since all information circulates in a single format, understood by all the elements related to the project. On the other hand, it was found that as the project went through different validation stages the uncertainties and risks of the project were reduced.

5 References

- Afonso, Paulo & Fernandes, João. (2018). Determinants for the Success of Software Startups: Insights from a Regional Cluster: 9th International Conference, ICSOB 2018, Tallinn, Estonia, June 11–12, 2018, Proceedings. 10.1007/978-3-030-04840-2_9.
- Brown, Tim and Katz, Barry. (2009). *Change by design: how design thinking transforms organizations and inspires innovation*, Primeira E. New York: Harper Collins.
- Chesbrough, Henry. (2006). Open Innovation: A New Paradigm for Understanding Industrial Innovation. Open innovation: researching a new paradigm.
- de Paula, Danielly & Araújo, Cristiano. (2016). Pet Empires: Combining Design Thinking, Lean Startup and Agile to Learn from Failure and Develop a Successful Game in an Undergraduate Environment. 617. 30-34. 10.1007/978-3-319-40548-3_5.
- Ghezzi, Antonio & Cavallaro, Andrea & Rangone, Andrea & Balocco, Raffaello. (2015). A Comparative Study on the Impact of Business Model Design & Lean Startup Approach versus Traditional Business Plan on Mobile Startups Performance. ICEIS 2015 - 17th International Conference on Enterprise Information Systems, Proceedings. 3. 196-203. 10.5220/0005337501960203.
- Grossman-Kahn, B. and Rosensweig, R.R. (2012). Skip the Silver Bullet: Driving Innovation through Small Bets and Diverse Practices. 10.13140/2.1.1834.4647.
- Merriam, Sharan. (1998). *Case study research in education: a qualitative approach*. Jossey-Bass Inc, San Francisco.
- Mueller, Roland & Thoring, Katja. (2012). Design thinking vs. lean startup: a comparison of two user-driven innovation strategies.
- Pisano, Gary & Teece, David. (2007). How to Capture Value from Innovation: Shaping Intellectual Property and Industry Architecture. California Management Review. 50. 278-296. 10.2307/41166428. Prahalad, C.K. and Ramaswamy, V. (2004), Co-creation experiences: The next practice in value creation. J. Interactive Mark., 18: 5-14. <https://doi.org/10.1002/dir.20015>
- Reis, Diane & Fleury, Andre & Carvalho, Marly. (2019). Toward a Recursive Stage-Based Framework for Supporting Startup Business Initiation: An Exploratory Study with Entrepreneurs. IEEE Transactions on Engineering Management. 10.1109/TEM.2019.2917406.
- Teece, David. (2010). Business Models, Business Strategy and Innovation. Long Range Planning. 43. 172-194. 10.1016/j.lrp.2009.07.003.
- Wikström, Solveig. (1996). Value Creation by Company-Consumer Interaction. Journal of Marketing Management. 12. 359-374. 10.1080/0267257X.1996.9964422.
- Ximenes, Bianca & Alves, Isadora & Araújo, Cristiano. (2015). Software Project Management Combining Agile, Lean Startup and Design Thinking. 9186. 356-367. 10.1007/978-3-319-20886-2_34.
- Yin, Robert. (2009). *Case Study Research: Design and Methods*. 4th ed. SAGE Publications, Thousand Oaks.