

# Analysis of Design Science Research Methodology and Entrepreneurship Connections

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# Resumo

Modelos de negócio importam para o sucesso de uma empresa. O mercado e as necessidades dos consumidores tendem a mudar rapidamente, tornando os modelos de negócio desatualizados, o que pode ser suficiente para que uma empresa falhe. Existe um conceito chamado “premature scaling” que explica como isto é possível. Há soluções que tentam resolver este problema de manter os modelos de negócio alinhados com o mercado e consumidores, e que ao mesmo tempo tentam fazer com que o modelo de negócio seja inovador. *The Lean Start-Up*, apesar de ser um ciclo iterativo e científico, não especifica quais as atividades necessárias a ser executadas em cada um dos passos, para que origine inovação no modelo de negócio. *Business Model Design Framework for Viability* está focada em criar modelos de negócio inovadores que durem um longo período de tempo, mas não chegou a ser executado em casos reais. Usando o *Design Science build-evaluate loop*, vão ser exploradas as contribuições que o *Design Science Research Methodology* pode ter na inovação de modelos de negócio, através do mapeamento de actividades de *Business Model Generation* nos passos da metodologia. O método proposto foi avaliado através de entrevistas a praticantes da área de empreendedorismo e inovação de modelos de negócio.

**Palavras-Chave:** Modelo de negócio, inovação de modelos de negócio, DSRM, Business Model Canvas, Business Model Generation, Design Science.



# Abstract

Business models matter for the success of a company. The market and the needs of the customer tend to change rapidly, making the business model outdated, which can be enough for the company to fail. There is a concept called “premature scaling” that explains how this is possible. There are solutions that try to solve this problem of maintaining the business model aligned with market and customer, and to try to innovate the business model at the same time. *The Lean Start-Up*, although it is based on the scientific cycle, and is iterative, it does not specify the activities that are necessary to execute in each of its steps to practice business model innovation. *A Business Model Design Framework for Viability* focus on creating innovative business models that last a longer period of time, but it was not executed in real cases. Using the *Design Science build-evaluate loop*, it is going to be explored the contributions that the *Design Science Research Methodology* can have on business model innovation, by mapping in the methodology Business Model Generation activities. The proposed method was evaluated by interviewing practitioners that are on the entrepreneurship and business model innovation fields.

**Keywords:** Business model, Business model innovation, DSRM, Business Model Canvas, Business Model Generation, Design Science.





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# List of Acronyms

<b>DSRM</b>	Design Science Research Methodology
<b>BMC</b>	Business Model Canvas
<b>MVP</b>	Minimal Viable Product





# 1. Introduction

Nowadays, it was identified that a business model matter for the success of company (Magretta, 2002; Chesbrough, 2007), and it is being seen an increase on studies on the topic of Business models (Wirtz *et al.*, 2016), because it is being concluded that business models that are more innovative can make an organization have a bigger position on the market (Markides and Sosa, 2013), (Wirtz *et al.*, 2016), and the businesses that are financial outperformers put more emphasis on their business models than the underperformers (Giesen *et al.*, 2007).

But one of the key issues is that startups tend to not have an innovative business model, because they do premature scaling (Marmer *et al.*, 2011). In premature scaling, Business model is one of the dimensions that make startups to fail (Marmer *et al.*, 2011). The Startup Genome Report states that 70% of the startups failed due to premature scaling (Marmer *et al.*, 2011). There are two approaches that try to solve the problem: The Business Model Design Framework for Viability (Souza *et al.*, 2015), and The Lean Startup (Ries, 2011). An issue of the first approach is that The Business Model Design Framework for Viability was not used in real cases (Souza *et al.*, 2015), and an issue identified in the Lean Start-Up is that it is specified in a general way, what to do in each of the steps of cycle, instead of having delineated activities that define what has to be done in each of the steps.

DSRM is a methodology that is used in Information Systems to create artifacts such as constructs, models, methods, or instantiations (Peffer *et al.*, 2007). Business models can also be considered models (Baden-Fuller and Morgan, 2010), therefore the objective of this investigation is to see if it is possible to use the DSRM in order to generate business models. The artifact that is proposed is the DSRM integrated with the activities of Business Model Generation (Osterwalder and Pigneur, 2010). Each step of the method has a set of activities that represent what is necessary to do to create a business model.

This artifact went through two interactions of the build and evaluate loop, and in each evaluation, interviews were made to practitioners that are from the field of entrepreneurship or business model innovation. The practitioners answered to a semi structured questionnaire either face-to-face or through an online meeting. In each iteration the artifact was changed according to the feedback, until it was conceptualized the final proposal.

## 1.1. Research Problem

Research on business models concluded that these models are essential for the success of a company (Magretta, 2002; Chesbrough, 2007), and recently, it is being shown that the development of new business models can make companies to earn more or less market share, depending on how innovative the business model is in its environment (Markides and Sosa, 2013). The success of a company can be either by being the company that shows the best financial results, or by providing the best value to customers (Osterwalder and Pigneur, 2010), and the companies that are financial outperformers put

more effort on their business models than the underperformers (Giesen *et al.*, 2007). But business models tend to fail in maintaining a successful path after one or two years, because the market changes, and if the business model does not adapt to the new environment and needs of the customer, it becomes outdated (Chesbrough, 2010). There is a term called *premature scaling* from the Startup Genome report that analysed the lifecycle of more than 3200 technological startups and shows with data that this phenomenon affects the performance of the organization (Marmer *et al.*, 2011). This phenomenon can cover the possibility of a business model becoming outdated.

In the Startup Genome report, it was defined that a startup has 6 stages in its lifecycle: Discovery, Validation, Efficiency, Scale, Sustain and Conservation. Along the lifecycle of the startup, the authors defined that the startup has an *actual stage* and *behavioural stage*. The *actual stage* is the response that customers are giving to the product that the startup offers, and that is measured through metrics such as numbers of users, user growth, activation rate, retention rate and revenue. The *behavioral stage* is constituted by 5 dimensions that the startup can control. Those dimensions are Customer, Product, Team, Financials and Business Model. The *actual stage* and 5 dimensions of the *behavioral stage* are all classified into one of the 6 developmental stages of the startup (Marmer *et al.*, 2011).

Premature scaling happens when one of the dimensions in the behavioral stage is in a higher developmental stage than the actual stage of the startup (Marmer *et al.*, 2011). For example, supposing that a startup is just starting out, its actual stage is classified as Discovery (level 1), because the startup must discover a new product, or discover if exists customers for the startup's product. If the startup in its business model dimension from the behavioral stage, starts to focus on profit maximization, which is a behavior that is considered to be in the Efficiency stage (level 3), it will be enough to cause the startup to be in a scenario of premature scaling, because the company is focused on increasing the profit margin of a product, when it did not even found the customers that want to buy the product.

Premature scaling made 70% of startups to fail, and it might explain the failure of 90% of the startups (Marmer *et al.*, 2011). Based on the analysis of 3200 high growth internet startups, Figure 1 shows that inconsistent startups, which are the ones that suffer from premature scaling, 93% of them do not break the \$100K revenue per month threshold (Marmer *et al.*, 2011).

With this indicator in mind there are two approaches that were considered to solve this issue:

- The Business Model Design Framework for Viability which is a framework, that could generate business models that would be viable through a long period time, considering the market changes (Souza *et al.*, 2015);
- And the Lean Start-Up which is a cycle that is constantly renovating its business model, so that it could be adaptable to the market (Ries, 2011; Blank, 2013).

The first approach, the Business Model Design Framework for Viability was not put into the test on real situations, it was just evaluated by experts (Souza *et al.*, 2015). On the other hand, the second approach was applied on the real world, and it produced real results (Blank, 2013).

The Lean Start-Up method is a continuous process that uses the scientific method, starting with an assumption, make a minimal viable product, and put it on the market, and then evaluate the results (Ries, 2011). This can be reinforced, as a good practice, by a case study of a Spanish dietary products business that provides empirical support that business model innovation is achieved by a continuous process that starts with an initial experiment followed by continuous assessment and modification to suit changing conditions in which the business model is in (Sosna, Trevinyo-Rodríguez and Velamuri, 2010).

This adaptability has the potential to improve firm performance, and there are also studies that provide a consensus that business model innovation is key for firm performance (Zott, Amit and Massa, 2011).

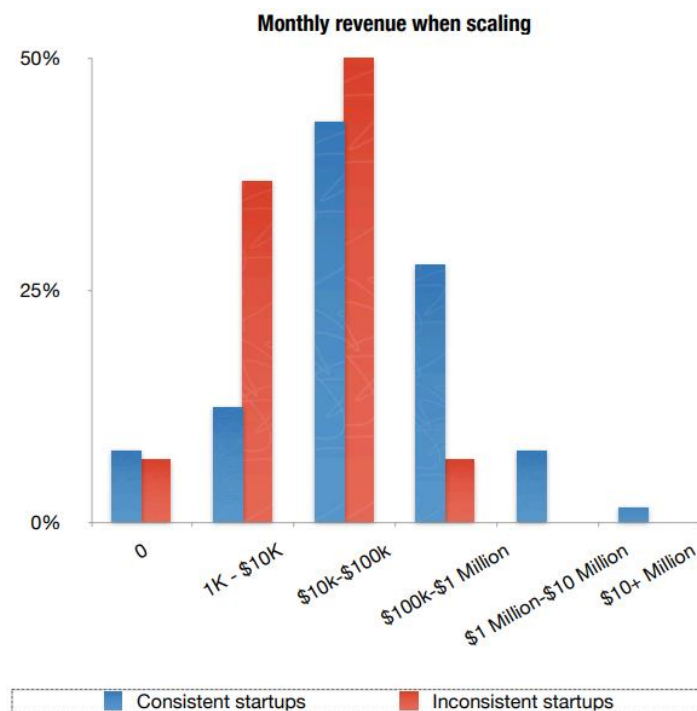


Figure 1 - Monthly revenue when scaling (Marmer *et al.*, 2011)

Even though The Lean Start-Up purposes an adaptable cycle, it only explains in a general way the steps that should be taken to create and renovate a business model, and when to Pivot or Preserve, but it does not have specific activities delimited that help you follow through those steps in the cycle.

So it might take some cycles to get to an innovative business model, or it might not even reach that point. The Lean Start-Up doesn't use a structured approach when executing each of the steps of its cycle, for example for understanding and develop the customer and their needs (Mueller and Thoring, 2012).

The problem still remains: The percentage of startup failure is high. That is why it is needed a more scientific and structured approach to generate innovative business models (Wirtz *et al.*, 2016).

One scientific approach that can be used to generate models is the DSRM (Peffer *et al.*, 2007), and because business models are models (Baden-Fuller and Morgan, 2010), it is possible to use the DSRM

to generate business models. So, the research question in short is: Which are the contributions of DSRM to generate business models?

## 1.2. Research Methodology

This research has the purpose of expanding the current body of knowledge on the field of business model innovation. For this, it could be used one of three research methods: Case-Study research, Action research, or Design-Science research. Using Case-Study research, it would be extracted quantitative and qualitative data regarding certain phenomenon's and then derive a theory that could explain them (Zaidah and Zainal, 2007). But in this case, it was not found literature that uses the DSRM to perform Business Model Innovation, therefore it cannot be extracted theories on how the DSRM was contributing to the innovation of business models. This leads to choose the one of the other two research types. Either in Action Research and Design-Science research, both of them are intended to create something that serves a purpose, but in the case of Action Research, new solutions are conceived to fulfill a problem identified in an organization (Cole, 2005), where the Design Science research creates IT artifacts that “*extend the boundaries of human problem solving and organizational capabilities by providing intellectual as well as computational tools*” (Hevner *et al.*, 2004). The research will follow the Design Science paradigm, where it has its roots from the book “Sciences of the artificial” by Herbert A. Simon (Simon, 1997), and the paradigm consists of creating artifacts that are intended to solve an identified novel problem that also creates value or has utility. The design science paradigm has a build and evaluation phase, where the build phase is focused on building the artifact that has a purpose which is to solve a problem, and the evaluate phase is focused in evaluating the performance of the artifact when solving the problem encountered (March and Smith, 1995). This paradigm has a loop, where it goes through several iterations of building an artifact, and then evaluating the performance of the artifact, so that adjustments can be made on the next iteration of the build phase. By doing more than one iteration, it will serve as justification for the proposal of the final artifact (Markus, Majchrzak and Gasser, 2002). There are four possible artifacts that are developed in either behavioral and design science, which are constructs, models, methods, and instantiations (March and Smith, 1995). The way in which the research was processed, can be seen in Figure 2, and it can be seen in a bigger scale in the Appendix A.

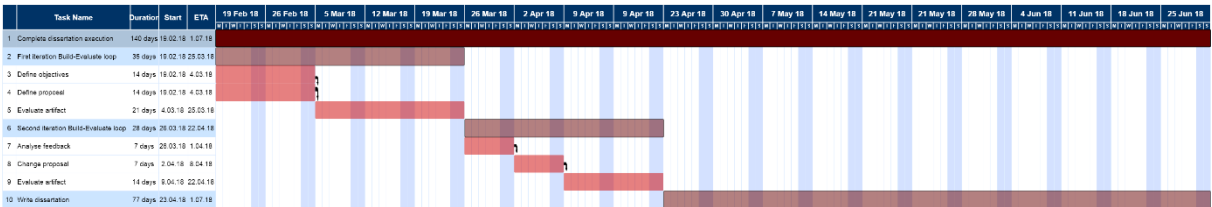


Figure 2 - Research gantt chart

In this research, the motivation and identification of the problem are in section 1.1, the understanding of the previous solutions that tried to solve the problem identified is in section 2, the definition of the

objectives of the solution and the proposal of the final artifact are in section 3, and these sections all belong to the build phases of the research. The definition of the objectives of the evaluation and its iterations in this research are in section 4, the lessons learned, limitations of the research and future topics to be investigated are all in section 5, and these sections all are part of the evaluation phase of the research.



## 2. Related Work

In this section, it will be reviewed in section 2.1 the book Business Model Generation, covering the all the 9 Building blocks in the Business Model Canvas, the Patterns that a business model can have, the Design techniques that can be used when designing the business model, the Strategies that can be used in order to assess the performance of the business model and the environment in which it is in, the Process that the authors suggest to generate and maintain a business model and the Outlook, where it is explained how can the business model canvas be implemented in different contexts. In section 2.2 it will be reviewed the Lean-Start Up, where it is going to be explained how the Build-Measure-Learn Feedback Loop works. In Section 2.3 it is reviewed the Design Science Research Methodology where it is explained the purpose of the methodology, how to execute each step and the possible ways to start the cycle. And in the section 2.4 it is done a critical analysis of the three solutions, describing what are the similarities, and differences between the Business Model Generation, Lean Start-Up and Design Science Research Methodology.

### 2.1. Business Model Generation

It is a book written by Alexander Osterwalder & Yves Pigneur that delivers a model which is the Business Model Canvas (BMC), Patterns that define the behavior of the Business Model, Design activities that are intended to create a novel Business Model, Strategies to manage the Business Model and a Process to guide practitioners on the development of the Business Model (Osterwalder and Pigneur, 2010).

#### 2.1.1. Business Model Canvas

First it presents the Business Model Canvas (Figure 3) which is a model that contains 9 building blocks that are the key blocks that describe the rationale of the business model, and covers 8/10 business concepts where it can be seen in Appendix B (Wirtz *et al.*, 2016):

- **Key partners (KP):** It is the network of suppliers that make the business model work.
- **Key Activities (KA):** Are the most important activities in the business to demonstrate the intended value.
- **Key Resources (KR):** The most important resources that will allow the business model to work.
- **Value proposition (VP):** Are the products or services that bring value to an intended customer segment.
- **Customer Relationships (CR):** Are the types of relationships that the business establishes with a customer segment.
- **Channels (CH):** Are the ways in which the business communicates its value to the customer segment.
- **Customer Segment (CS):** Are companies or people in which the business will deliver a product or service.
- **Cost structure (C\$):** Describes the costs that the business model must have to operate.

- **Revenue stream (R\$):** Describes the cash that the business will generate with each customer segment.

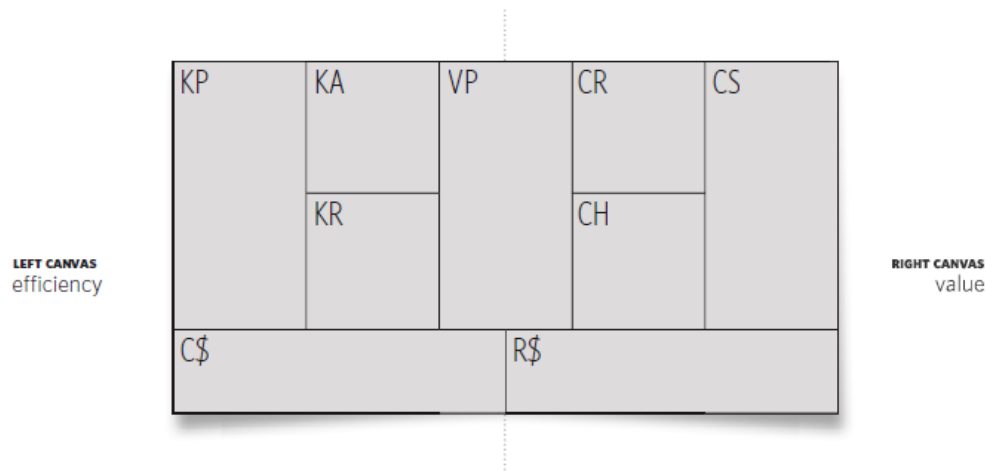


Figure 3 - Left canvas, Right canvas (Osterwalder and Pigneur, 2010)

In Figure 3 shows that the Business Model Canvas is structured in way that separates the building blocks that are more focused in efficiency and value, being the value proposition the conjugation of the two.

## 2.1.2. Patterns

After that, the authors introduce Patterns, which are possible dynamics that can exist in a business model. A business model can have more than one pattern. The business core concepts that these patterns are based on, are:

- **Unbundling:** The company will run fundamentally three types of businesses (Customer Relationship, Product Innovation, and Infrastructure), where can be “Unbundled” from each other, which have different economic, competitive, and cultural imperatives. They can co-exist, but they have to be careful, so they avoid conflicts, or unwanted trade-offs.
- **The Long Tail:** The company will focus on developing a platform that will sell many products for various customer segments. It requires low inventory costs and a strong platform, so that it has products always available for interested buyers. (ex: Book publishing industry, Lego)
- **Multi-Sided Platforms:** It is a platform that brings two or more customer segments together that are distinct but interdependent. The value of these businesses lays on the facilitation that different customer segment have in interacting with each other. (ex: Google, Apple iTunes store)
- **FREE:** In this pattern, at least one of the entities in the Customer Segment will beneficiate constantly from the free-of-charge services and products that the business model provides. Implementing other patterns, will make the Free pattern possible. The customers that use freely the services, are financed by other part of the business, or by other Customer Segment. (ex: Freemium, Open Source)



- **Open Business Models:** In this pattern, companies capture value by creating products or services that are essential for other businesses, creating a partnership. (ex: Procter & Gamble, GlaxoSmithKline's patent pool)

### 2.1.3. Design

Then the authors show some techniques to design the business model, so it can become more unique, and in that moment in time, can fulfil better a need in the market. The business model design techniques are:

- **Customer Insights:** It is a design technique that is focused on understanding the customer, and this can be done by using “The Empathy Map” that is shown in Figure 4. By understanding the customer through the “The Empathy Map”, it can be defined all the other building blocks in accordance to the results of the map.

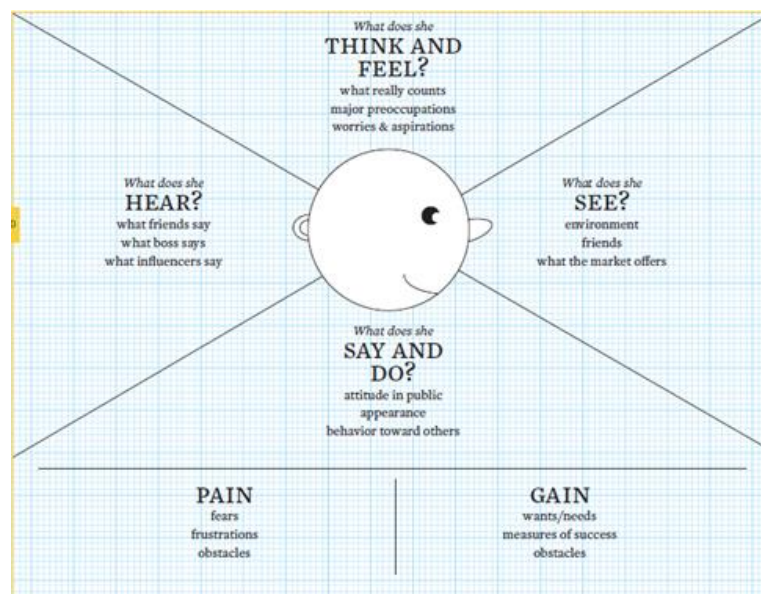


Figure 4 - The Empathy Map (Osterwalder and Pigneur, 2010)

- **Ideation:** This technique is a process that is focused on generating a large number of business models, and then isolating the ones that better solve the problem that was identified. The Figure 5 gives a perception on how it progresses the number of business ideas.

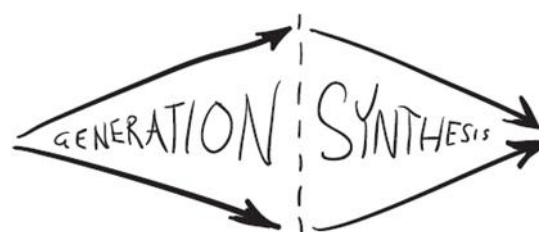


Figure 5 – Ideation (Osterwalder and Pigneur, 2010)

- **Visual Thinking:** Use visual tools to understand and communicate the intended business model. By using post-its, cartoons, and sketches it is possible to visualize and discuss new

ideas with the members in the organization, and the Figure 6 is a representation of how this can be achieved.

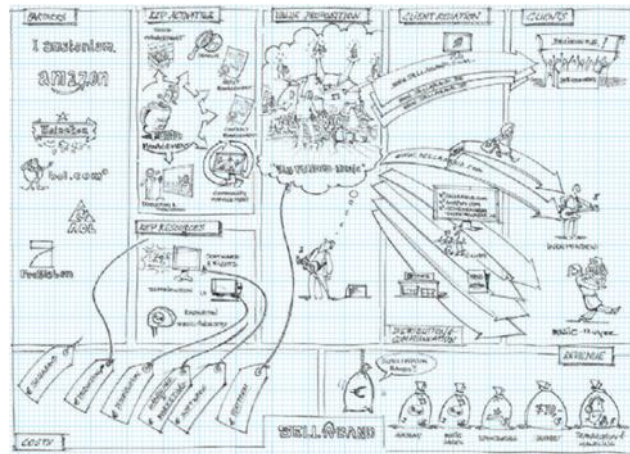


Figure 6 - Visual Thinking (Osterwalder and Pigneur, 2010)

- **Prototyping:** It is a tool to explore different directions in which the business model could be taken. A business model prototype could be submitted to a variety of issues that could be addressed, refining the business model prototype along the way.
- **Scenarios:** It is a technique that puts the business model through different scenarios, and this can be seen in the Figure 7. The scenarios can be divided in two categories: scenarios with different customer or market settings, and scenarios with future environments in which the business model might compete in. It applies also scenario planning techniques to help foster a more informed innovation of the new business model.

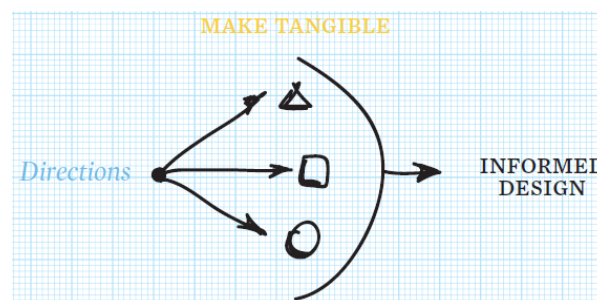


Figure 7 – Scenarios (Osterwalder and Pigneur, 2010)

- **Storytelling:** It is a technique that helps communicate in a more tangible way how the new business model works. It can be used to introduce the new, pitch the business model to investors and engage employees. It can be done through Talk and Image, videoclip, role play, text and image, and comic strip.

## 2.1.4. Strategy

When the business models are designed, they need to be assessed, be integrated with other business models, and it has to be understood which are the circumstances that influence the performance of the

business model. Business Model Generation presents the following activities that help understand those concerns:

- **Business Model Environment:** Understanding of the 4 forces (Key trends, Industry Forces, Market Forces, Macro-Economic Forces) that might be influencing the business model. By doing this, it can be developed business models that can be more competitive.
- **Evaluating Business Models:** Activity where it is done an assessment of the business model, and it is done in two ways: by doing a big picture assessment, and by using the SWOT analysis to identify in each building block its strengths, weaknesses, threats and opportunities.
- **Business Model Perspective on Blue Ocean Strategy:** This activity blends the Blue Ocean Strategy with the Business Model Canvas, where it identifies the aspects in the building blocks that should be reduced or eliminated, and the ones that should be raised or created. This can be seen in Figure 8.

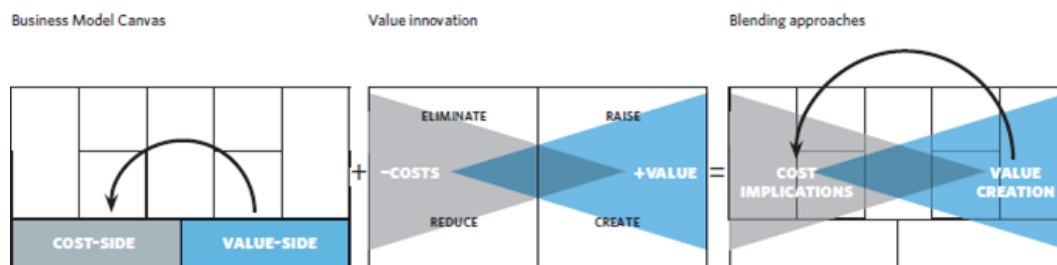


Figure 8 - Blending Blue Ocean Strategy with BMC (Osterwalder and Pigneur, 2010)

- **Manage Multiple Business Models:** This activity aims to manage the various business models that a company might have. There are three variables that are taken into consideration when it is analysed the possibility of integration between two or more models: Severity of conflict, strategic similarity, and risk.

## 2.1.5. Process

Here the authors present a generic business model design process that consists in the following phases:

- **Mobilize:** Assemble a team and share the vision of a need for a new business model. This can be done through the following activities: Business Model Canvas, Storytelling.
- **Understand:** Analyse critical elements that might need to be taken into consideration when designing the business model. This can be done through the following activities: Business Model Canvas, Business Model Patterns, Customer Insights, Scenarios, Business Model Environment, Evaluating Business Models.
- **Design:** Design various viable business models and select the best one. This can be done through the following activities: Business Model Canvas, Business Model Patterns, Ideation, Visual Thinking, Prototyping, Scenarios, Evaluating Business Models, Business Model Perspective on Blue Ocean Strategy, Managing Multiple Business Models.

- **Implement:** Implement the chosen business model. This can be done through the following activities: Business Model Canvas, Visual Thinking, Storytelling, Managing Multiple Business Models.
- **Manage:** Define a team, and continue to assess, transform, and innovate the current business model. This can be done through the following activities: Business Model Canvas, Visual Thinking, Scenarios, Business Model Environment, Evaluating Business Models.

It is not mandatory that these phases are followed through sequentially, but normally, the Understand and Design phases tend to happen in parallel, and when designing new business models in the Design phase, it might come up a model that needs more research, requiring the team to jump back from the Design phase to the Understand phase. In the Manage phase it is required a continuous assessment and management of the current business model.

### 2.1.6. Outlook

In the outlook it is shown different possible ways of integrating the business model canvas in different contexts of the market and specially in IT, showing it can align the business model canvas with the IT architecture, by defining three layers: at the top lays the business, in the middle the applications, and at the bottom the technology.

## 2.2. Lean Start-Up

The Lean Start-Up is a book that explains a new method for developing start-ups. In the book, a Start-Up is defined as a human institution designed to create a new product or service under conditions of extreme uncertainty. This includes from small institutions to big established corporations, and the success metrics for a start-up are how fast and how much knowledge the institution can generate. The knowledge generation is done through the Build-Measure-Learn Feedback Loop.

### 2.2.1. Build-Measure-Learn Feedback loop

Figure 9 represents this loop, and starts with an idea or an assumption of what are the market needs, also called Leap-of-Faith assumptions which are the value hypothesis and growth hypothesis where according to Ries: *“The value hypothesis tests whether a product or service really delivers value to customers once they are using it.”*, *“The growth hypothesis, tests how new customers will discover a product or service”*. Then the assumption has to be materialized with the least amount of resources, creating a MVP (minimal viable product), and test it as soon as possible. The MVP is put in the market, and it has to be measured the results that it is producing with relevant metrics to evaluate the results in order to learn if it is being made progress or not. If the results are not good enough to prove that the leap of faith assumption was right, then it is time to pivot, and generate new ideas that are different from the previous one. If the results are good enough to prove the leap of faith assumption, then it preserves the MVP, and the cycle continues, generating MVP’s that are possible improvements from the previous one.

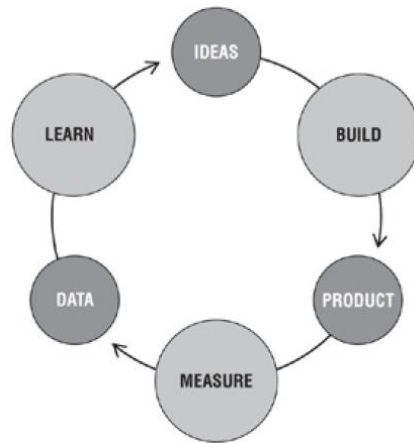


Figure 9 - Build-Measure-Learn Feedback loop (Ries, 2011)

This loop has to have an engine of growth in which is the base for all the actions. All the assumptions, MVP's, and metrics have to be in accord with the engine of growth, so that it is not lost track of the knowledge that it is wanted to generate. It is possible that the engine of growth has to pivot and continue the loop with another one.

## 2.3. Design Science Research Methodology:

Design Science Research Methodology for Information Systems research is a methodology developed with the purpose of generating artifacts that have a purpose and solve an instance of a problem (Peppers *et al.*, 2007). DSRM incorporates principles, practices, and procedures, in order to meet three objectives:

- Being consistent with prior literature.
- Providing a nominal process model for doing DS research.
- Providing a mental model for presenting and evaluating DS research in IS.

Figure 10 represents the DSRM, and it follows six steps which are:

- **1st problem identification and motivation:** Define the specific research problem and justify the value of the solution.
- **2nd definition of the objectives for a solution:** Infer the objectives of a solution from the problem definition and knowledge of what is possible and feasible.
- **3rd design and development:** Design the artifact that will solve the problem. Such artifacts are potentially constructs, models, methods, or instantiations (each defined broadly) (March and Smith, 1995).
- **4th demonstration:** Apply the solution on one or more instances of the problem.
- **5th evaluation:** Evaluate the performance of the solution by comparing the results that the solution got with the objectives defined in the second step. This is done using critical metrics that the researcher has knowledge of. If the results presented are not good enough to reach the defined objectives, then it is time to go back to the second step, and define new objectives that

the solution should have, or go to third step and design a more effective solution. If the results are good enough and conclusive, then it is proceeded to communicate the solution.

- **6th communication:** Communicate the problem and motivation, the objectives of the solution, the way it was design and developed, how it was realized the demonstration, and how it was evaluated the solution to researchers and relevant audiences. This part can be done in meetings, or conferences.

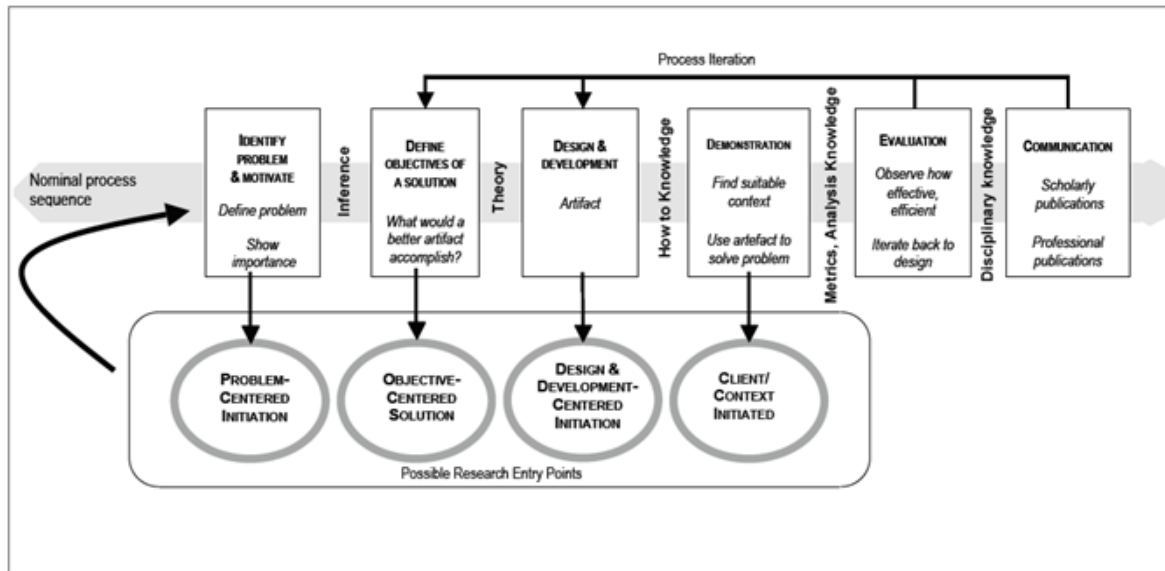


Figure 10 - DSRM process (Peffer *et al.*, 2007)

In these 6 steps of the cycle, there are four different possible ways to start the research. The research can start on first step, by finding a problem that must be solved. It can start on the second step, by defining first what are the objectives that the solution must reach. It can start on the third step, by starting to conceptualise an artifact. And it can start on fourth step, by demonstrating that exists a context for the intended solution.

## 2.4. Critical analysis:

Between DSRM, Lean Start-Up and Business Model Generation, there are some aspects that they have in common:

- All the solutions have a process that have to follow through. In the case of The Lean Start-Up the process for developing the startup is the Build-Measure-Learn feedback loop. In the case of the DSRM it is the steps that the DSRM proposes. And in the case of Business Model Generation, it proposes a process composed of the Mobilize, Understand, Design, Implement, and Manage phases.
- They all generate an artifact. In the Business Model Generation is the Business Model, in the Lean Start-Up is the MVP, and in the DSRM is an artifact that could be a construct, model, method, or an instantiation.

- The process is cyclic, it always goes to a previous a step to refine the artifact that is being generated. In the case of The Lean Start-Up the Build-Measure-Learn loop feedback loop is always starting over to develop a better MVP, make a new evaluation, or try out new assumptions. In the case of DSRM, in the Evaluate phase, you may have to go back to the objective step, or design to improve the artifact. And in the case of Business Model Generation, it is normal to jump from the Design phase to the Understand phase when it is designed a novel business model and there is a necessity to gather more information about the market or customer to prove the new design.
- They all generate new knowledge, in the Lean Start-Up is putting the MVP to the test and understand through the results if it is needed to do a completely different MVP or continue improving the previous one. In the DSRM, is finding a problem that must be solved based on prior research, create an artifact that solves at least an instance of the problem, implement it, compare the results of the artifacts with the objectives that were defined, and communicate the new knowledge that was generated with the intended solution. In the Business Model Generation is understanding first the context of the situation in which the company is, design a business model, implement it and evaluate if the model is still adequate to the market, and if not, repeat the process and generate a better one that takes into account the new context and prior models.
- Lean Start-Up and DSRM follow a scientific process, which is defining a problem to solve, define the objectives or metrics that will be taken into consideration with the new solution, build the MVP, or design the artifact that will solve the problem, implement it, evaluate the results that were produced with the objectives defined, learn and communicate the next steps that should be taken.

These were the major aspects that were in common between the three ways of generating knowledge and innovating the business models. But there are some key aspects that make them unique and are important to integrate them to generate a new solution.

- In the DSRM, it presents 4 different ways of starting research and generate a solution. It can be problem centric, objective centric, design centric, or context centric.
- In the Business Model Generation, it gives tools to build and understand the business model, and its environment. Activities such as Ideation, Evaluate Business Model, or even Business Model Patterns, help practitioners to have a concrete idea on how to develop the business model, while in DSRM and The Lean Start-Up, only abstract phases of the cycle are presented, and there are no activities delineated within each phase to guide the practitioner on its execution.





# 3. Proposal

In this section it will be explained the proposed solution for the research question that was identified in the section 1.1.

## 3.1. Objectives

Seeing that the Lean Start-Up Build-Measure-Learn feedback loop and the DSRM methodology are behaviorally similar, it is possible to use the DSRM methodology to develop artifacts that are related to entrepreneurship. In this research, entrepreneurship is defined as *“a process by which individuals-either on their own or inside organizations-pursue opportunities without regard to the resources they currently control (Stevenson, Roberts and Grousbeck, 1989).”* This definition was chosen because it goes hand-in-hand with the DSRM process, which is used to identify new problems in the scientific literature, which can be turned into new opportunities to develop artifacts that will solve the problem and expand the scientific literature. With this definition also, by seeking new opportunities, the company has to come up with new solutions that are intended to fulfil those opportunities. These solutions can be considered artifacts. Artifacts related to entrepreneurship can be of various kinds, from products to new services, and with more emphasis recently, even business models. Because business models can be considered models (Baden-Fuller and Morgan, 2010), it is possible to use the DSRM to create new business models.

This research will be focused on how can DSRM contribute to the innovation of business models. This implies that the DSRM must generate an artifact, which is the business model. The methodology is abstract enough to incorporate tools that serve that purpose (Peffer *et al.*, 2007), and also because there needs to be a more in-depth research on the integration of knowledge tools in the methodology to define best practices (Geerts, 2011), which in this case are related to business model innovation. It will be used the Business Model Generation, because not only presents a concrete business model concept (Business Model Canvas) that covers 8/10 business concepts (Wirtz *et al.*, 2016), and it was previously integrated in the Lean Start-Up to describe the business model rationale (Ries, 2011), it also provides several activities that facilitate its conception (Osterwalder and Pigneur, 2010), specially Strategy activities which are a key component to make the business model innovative (Abraham, 2013). By providing a set of activities to develop a business model, it gives room to map them in the DSRM, so through the design and evaluation of new mappings, it will be seen which the more appropriate activities are to be mapped in the methodology in order to reach a method that can best achieve business model innovation.

For that reason, the objective of this research is to map the Business Model Generation activities in the DSRM.

## 3.2. Definition

The solution that will be proposed is the mapping of Business Model Generation activities in the DSRM steps, creating an artifact that is identified as a method (March and Smith, 1995), designed to generate new business models that are intended to solve a problem of the market or the consumer. In the future, this method can be applied in the context of startups that are part of the technology industry, and it can be used from the beginning of startup's life cycle, creating an innovative business model that is aligned with their actual stage. The artifact is a DSRM approach to the generation of business models, and it is represented in Figure 11.

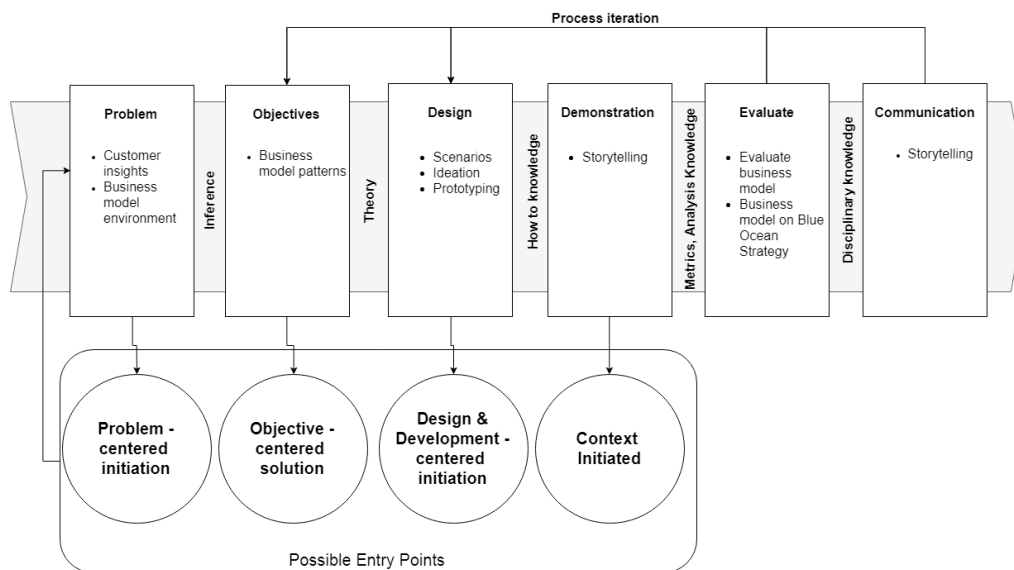


Figure 11 – Proposal research method

In the following sections it will be explained for the each DSRM step, the rationale for the mappings of the Business Model Generation activities.

### 3.2.1. First step: Problem definition and motivation

In the first step of the DSRM, it has to be defined the problem, and also its motivation. In the DSRM the problem has to be based on prior literature, and prior literature in a context of the market means that there were problems in the market that were already been solved, or that it was conceived solutions for that problem. But in the past, there were problems that might have been identified but they were not relevant to be solved, because the market or customers were not prepared for it. To match the scientific problem environment with the business problem environment, it has to be taken into consideration the customer needs and forces of the market. And in this step, that can be accomplished through the following activities:

- **Customer insights:** The startup when is going through the methodology, first it will need to understand their customers through the Empathy Map. Doing that, it is possible for the startup to understand the behavior of the customer. The information generated with the map can serve as motivation for the company to identify needs that the customer did not think of yet.

This activity is applied also in future iterations of the startup lifecycle even if it has a preexisting business model, because the idea is to make sure that the startup understands the current problems of the customer. It is possible that previously the startup identified a customer need, but now the need might have changed, and by identifying it, it gives possibility for growth.

- **Business model environment:** After customer insights, the startup has to go through this activity in order to understand the forces that the market has. These forces are Industry forces, Key trends, Market forces, and Macro-economic forces, and by understanding them, it will be possible to know the issues that the company must be concerned about, and also positive aspect the company can take advantage of.

### 3.2.2. Second step: Objectives

In this second step of the DSRM, it is when the objectives of the solution to the problem found have to be defined, outlining which results or behaviors that are considered ideal and that the solution has to arrive, considering what is possible and feasible. In a business context, one has to define what behavior is considered to be the most appropriate for the business model to solve the problem, because even if there are business models that in detail are innovative due to the use of a different technology, or do business with different partners, in a higher-level perspective, most of the business models follow a certain business dynamic. To accomplish this, the following Business Model Generation activity is used:

- **Business model patterns:** One or more patterns are chosen that may best serve as the behavioral goal that the business model must have when solving the problem encountered, and also serves as the basis for designing an innovative model in the next step. The business model patterns that the Business Model Generation defined are Unbundling Business Models, The Long Tail, Multi-sided Platforms, FREE as a Business Model, and Open Business Models.

### 3.2.3. Third step: Design

In the third step of the DSRM, the artifact that will solve the problem is materialized. This artifact can be a construct, model, method, or instantiation. Since it is being designed a business model, this artifact falls into the model category. Here in the design stage, it is going to be used the business model canvas. The creative process will be based on the information that the startup already has when it identified the problem, the benefits or counterproductive aspects of the market, and one or more patterns that were defined in the objectives phase. For this step, it is only required that the business model be designed with the following techniques:

- **Scenarios:** It starts out with this activity, where it is first defined what are the possible scenarios that exist in the market and which are the types of customers that the startup is dealing with.
- **Ideation:** Then with this activity, it is brainstormed all the possible business models that might be conceived, and then choose the best ones.
- **Prototyping:** After a business model is conceived, the developers will submit the business model through a variety of issues, testing different possibilities that could be implemented in the business model.

### 3.2.4. Fourth step: Demonstrate

In the fourth step of the DSRM, the artifact must be demonstrated by solving an instance of the problem, and it can be done through experimentation, simulation, case studies, proof, or other appropriate activity. In the business perspective, this implies that the startup has to demonstrate the behavior of its business model, and that can be done by putting its product or service on the market and see what results generate by communicating with partners, startup workers, and customers about the product or service. For this to happen the following activity was mapped:

- **Storytelling:** It is important to use this technique in this phase when implementing the new business model in the startup, because it has to be effectively communicated to all the staff what are right tasks that they have to execute, also with partners so they can understand how they can contribute to the conception of the product or service, and also pass the right message to customers about the product that the business model provides, so it generates more results.

### 3.2.5. Fifth step: Evaluate

In the fifth step of the DSRM, the artifact has to be evaluated, by measuring how well the solution supports the identified problem and if it accomplishes the objectives that were defined. For this, it is required an assessment of the business model, so it is needed to execute the following activities:

- **Evaluate business model:** In this technique it is going to be assessed the strengths, weaknesses, opportunities and threats of the new business model, to see if those aspects are in accordance with the objectives defined and also with the problem that should be solving.
- **Business model on Blue Ocean Strategy:** This technique will evaluate what are the aspects of the building blocks in the business model of the startup that should be raised, reduced, created, or eliminated.

If in the evaluation phase, the results turned out to be in accord with the objectives defined, it is time to jump to the sixth step, if not, it is time to jump to the objective phase and define what are the patterns that are more aligned with the results, or to the design phase and design other business model, that tackles more effectively the problem according to the results and assessments that were obtained in the previous iteration.

### 3.2.6. Sixth step: Communicate

In the sixth step of the DSRM, the artifact has to be communicated to relevant entities in this theme about the problem that the solution solves, and its effectiveness. In this context, the entities could be possible investors, partners, acquired customers, and new customers. For this step, it was mapped the following activity:

- **Storytelling:** This technique is a way to communicate and show the progress that was accomplished with the business model. It can be done by talk, using video, images, role play and comic strips.

After the communication of the business model is complete, the process of developing an innovative business model is finished, but it is important that the process starts again, because the market or the needs of the customer can change in any point in time. The process can be initiated again in one of the four entry points: It was found a new problem in the customer or market (problem initiation), new objectives that have to be defined (objective-centered solution), the design of a new business model (Design & development – centered initiation), or the application of the business model in a new context (context initiated).



## 4. Evaluation

In this section is going defined in section 4.1 the objectives that were intended with the evaluation of this artifact, in section 4.2 it is shown the results of each iteration of the evaluation with the artifacts that were previously constructed to achieve the objectives in section 4.1.

### 4.1. Objectives

One of the purposes of the evaluation is to assess qualitatively the mapping of the Business Model Generation activities with the DSRM steps. By gathering values related of each mapping, it is possible to calculate the average and standard deviation of each mapping. Calculating the average values of the mappings, it will give an idea about the level of agreement that all the practitioners have about mappings in the methodology, and by calculating the standard deviation, it will be possible to see if there is a consensus between the practitioners on values that they are giving. The agreement will be based on the experience and knowledge that the practitioners have on the areas of entrepreneurship and business model innovation, and the values that they will give, will determine if the method can be used to innovate business models. By gathering the practitioner's opinion on the artifact, it is possible to have a better understanding on the evaluation that the practitioner is communicating, because his/her opinion can be helpful to clarify the reason why it was given a certain value to a certain mapping in the artifact.

Another purpose of the evaluation is to do it iteratively, where the artifact is conceptualized and evaluated more than one time. Doing this, the artifact can be refined in each iteration, because it is assessed the performance of the artifact, and the information that is gathered is used to develop a possible better artifact, that will try to increase the level of agreement between practitioners, and also the level of consensus among them. Even if the level of agreement did not increase, at least it is being explored different possibilities that are aligned with the objectives of the artifact.

### 4.2. Evaluation method

The evaluation was done with practitioners that practice entrepreneurship or help businesses to innovate on their business models which include also professors. It was scheduled a meeting face-to-face or through conference call with 4 practitioners in each iteration, out of 30 people that were reached either through referrals or email. In each iteration, it was interviewed one professor, one practitioner that is involved in the development of business models for startups, and two entrepreneurs. The people interviewed were not the same in the two iterations. The evaluation was focused on these types of practitioners because they have experience and have a general idea on what are the appropriate activities that have to be done to accomplish business model innovation.

During the meeting the evaluation was followed with the following structure:

- It was explained the artifact incrementally, guiding the practitioners through each mapping of the Business Model Generation activities in the DSRM steps.

- After each mapping was explained, it was asked in a scale 1 to 5, being 1 if they disagree completely, and 5 if they agree completely with the mapping. They gave their answer, and it was registered also any further comments that they gave in relation to the mapping that was presented.
- At end, it was asked what were the changes that the practitioners would recommend to the artifact.

In this research, two iterations were done. These are described in the next subsection.

### 4.2.1. First iteration

In the first iteration the artifact in Figure 12 was evaluated. Here it was not implemented yet the four perspectives that initiate the method, because it was assumed that each initiation of the problem had to pass through the problem phase, and also the context of the artifact in which it should be applied was not defined, so the artifact could either be applied on a stablished business, or on an startup in an early stage.

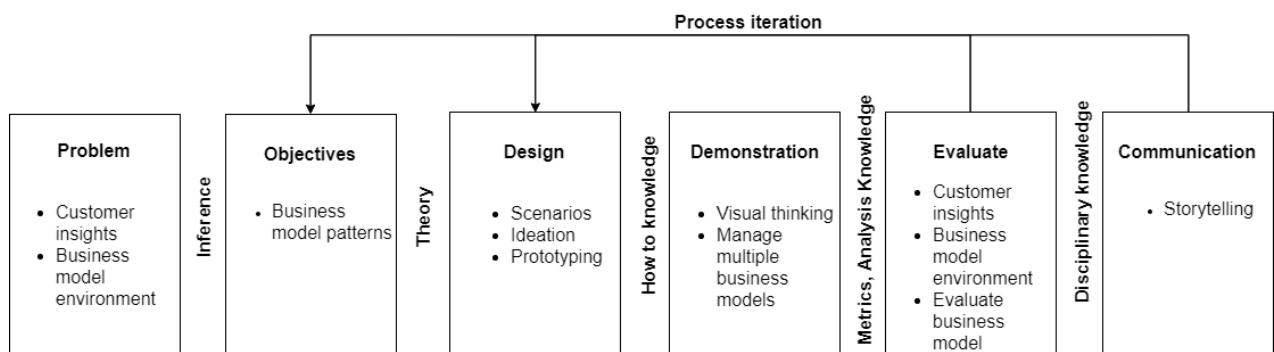


Figure 12 - First iteration of the research method

The results of the interviews of this iteration can be seen in Table 1, where 4 practitioners took part of this evaluation, and the average result of all the mappings in this method was 4, and with a pattern deviation of 1.24, which means that overall the practitioners have agreed with the mapping of the activities in the DSRM steps, but with considerable different opinions.

In the line “Manage multiple business models in the Demonstration phase”, it got an average value of 2, and a pattern deviation of 0,50, which means that overall the practitioners have disagreed with the mapping of the activity in the Demonstration phase, and so this activity was considered to be removed from this step when the next iteration of the artifact was developed.



Table 1 - First evaluation results

Mappings	Practitioner 1	Practitioner 2	Practitioner 3	Practitioner 4	Average	Pattern deviation
Customer Insights in the Problem phase	5	5	5	5	5	0,00
Business model environment in the Problem phase	4	5	4	3	4	0,82
Business model patterns in the Objectives phase	2	5	4	4	4	1,26
Scenarios in the Design phase	4	5	2	4	4	1,26
Ideation in the Design phase	5	4	4	3	4	0,82
Prototyping in the Design phase	4	3	2	4	3,5	0,96
Visual thinking in the Demonstration phase	4	4	2	5	4	1,26
Manage multiple business models in the Demonstration phase	2	3	2	2	2	0,50
Customer Insights in the Evaluation phase	2	5	1	5	3,5	2,06
Business model environment in the Evaluation phase	2	5	1	4	3	1,83
Evaluate business model in the Evaluation phase	4	5	5	4	4,5	0,58
Storytelling in the Communication phase	4	5	5	5	5	0,50
Total results					4	1,24

The activities “Customer Insights” and “Business model environment” that were mapped in the Evaluation phase got an average value of 3,5 and 3 respectively and a pattern deviation of 2,06 and 1,83 respectively, which means that there were practitioners that agreed completely with the mapping and there were practitioners that disagreed with the mapping, originating no consent between the opinions. These two activities were considered to be removed from the Evaluation step in the next iteration, because with the feedback that some practitioners gave, it would not make sense to analyse again the needs of the customer or the forces of the market if that would have to be done again in the Problem step of the next iteration of the method.

#### 4.2.2. Second iteration

On the second iteration, the evaluation process was repeated, with the artifact presented in Figure 13. In this artifact, due to previous feedback, it was important to add the 4 possible entry points because it influences the way the identification of the problem is approached. Also, the context of the method in this iteration was defined to be used in the context of startups that are in an early stage of development. The changes identified in the previous iteration were implemented in this new artifact, and it was also added up the activity “Business Model on Blue Ocean Strategy”, because one of the practitioners commented that using the SWOT analysis in the “Evaluate Business Model” activity is an outdated method, that it was important to add up techniques that are more up to date to the way that market is running currently.

The results of the interviews in this iteration can be seen in Table 2, the average value for all the mappings was 5 and it had a pattern deviation of around 1,19, which means that the level of agreement between practitioners increased, and it also increased slightly the level of agreement between the practitioners. This increase in the average value can be due to the removal of the mappings that the practitioners disagreed on and the mappings that had a pattern deviation value above 1,5. The decrease in the overall deviation pattern of the mappings can be due fact that the context of the artifact was defined to be applied in the startup context and also because the 4 possible entry points were added up.

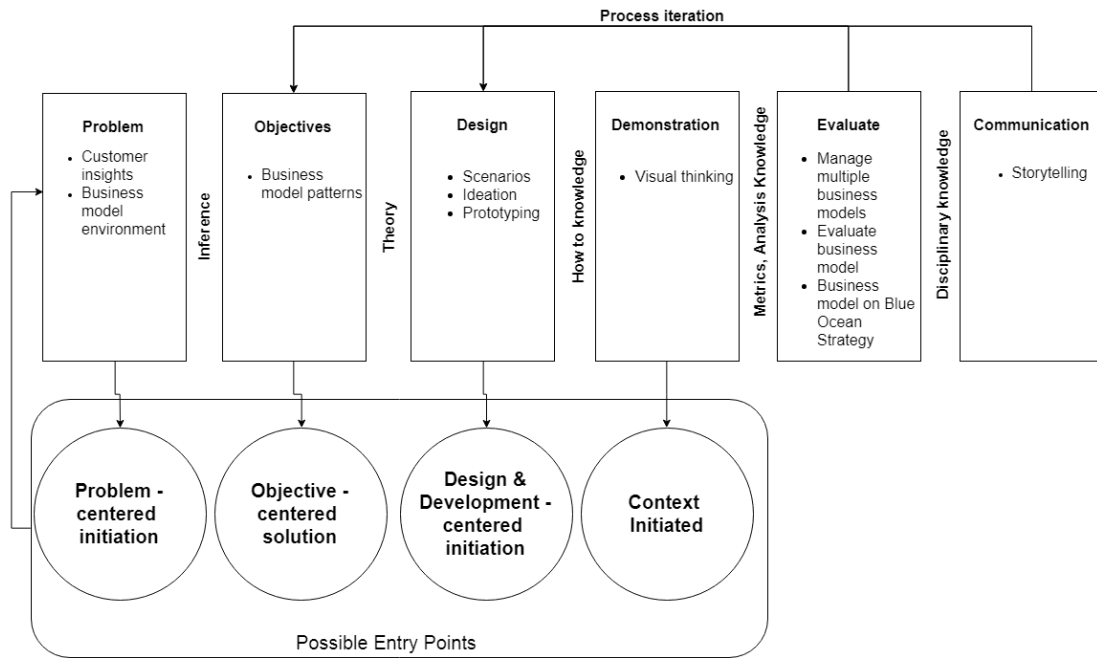


Figure 13 - Second iteration of the research method

In the conceptualization of this artifact, it was considered that the activity “Manage multiple business models” would be better mapped in the Evaluation step due to the possibility of a startup to have more than one business model in its lifecycle. But after doing the evaluation, practitioners disagreed with the mapping of the activity in the Evaluation step, and the feedback was that a startup on its early stage of development has to be focused on improving and innovating on its only business model. Only after the startup is fully developed and established, it can be concerned on developing other business models that help expand the business. With these reasons, this activity ended up being removed when the final artifact was developed.

Table 2 - Second evaluation results

Mappings	Practitioner 1	Practitioner 2	Practitioner 3	Practitioner 4	Average	Pattern deviation
Customer Insights in the Problem phase	5	5	5	5	5	0,00
Business model environment in the Problem phase	2	5	4	5	4,5	1,41
Business model patterns in the Objectives phase	2	4	3	5	3,5	1,29
Scenarios in the Design phase	4	3	5	5	4,5	0,96
Ideation in the Design phase	4	5	5	5	5	0,50
Prototyping in the Design phase	2	5	4	5	4,5	1,41
Visual thinking in the Demonstration phase	1	3	5	5	4	1,91
Manage multiple business models in the Evaluation phase	2	3	2	5	2,5	1,41
Evaluate business model in the Evaluation phase	4	4	5	5	4,5	0,58
Business model on Blue Ocean Strategy in the Evaluation phase	2	5	5	5	5	1,50
Storytelling in the Communication phase	5	5	4	5	5	0,50
Total result					5	1,19

In this iteration the Visual Thinking activity mapped in the Demonstration step had an increase on the overall deviation pattern between the practitioner’s opinion in relation to the previous iteration, even though the average value was 4 which means that the practitioners agreed with the mapping. This mapping ended up being substituted with the Storytelling activity, because in practice both activities are used to facilitate the communication of ideas, and it was an activity recommended by the practitioners when it was asked about the changes that they would recommend about the method.

## 5. Conclusion

In conclusion this artifact introduces a new scientific approach for the innovation of business models. The intention of this artifact, is to understand what are the contributions of the DSRM when it is mapped Business Model Generation activities, in order to generate new business models that can be more aligned with the actual situation in which the startups are in, and serve as a new process for the maintenance and alignment of the business model of the startup in every stage of its lifecycle. The results of the evaluation that was executed in each iteration of the research showed that practitioners agreed with the activities that were mapped in the DSRM, affirming this way that the DSRM mapped with the Business Model Generation activities can be used for business model innovation in the context of startups that are in an early stage of development. Also, this research ended up exploring possible arrangements between the Business Model Generation activities and the DSRM steps.

In this research, the results of the interviews that the practitioners gave to the artifact were limited to the body of knowledge and experience that each practitioner has in business model innovation and entrepreneurship. The communication and understanding of how the artifact works also affected the values that the practitioners gave in the evaluation.

Because this research was exploratory, the future work that could be done in this area is to develop case-studies where this process is executed in many startups and evaluate how many startups could still be on market with a sustained growth. Also, it would be interesting to see other models or activities related to business model innovation that could be mapped to the DSRM in order to create a more holistic process that covers not only the business model, but also the other 4 behavioral dimensions such as Product, Customer, Financials, and Team.



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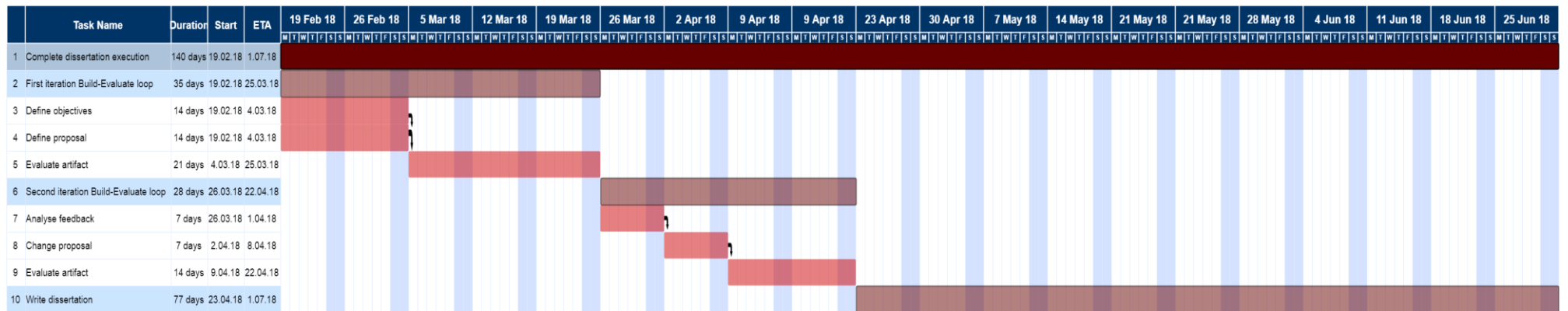
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# Appendixes

## Appendix A - Research Gantt Chart



# Appendix B – Business Model Components (Wirtz *et al.*, 2016)

Component Author	Strategy	Resources	Network	Customers	Market offering (value proposition)	Revenues	Service provision	Procurement	Finances	Spectrum of the Components
Hamel (2000)	Core Strategy, Strategic Resources		Value Network	Customer Interface						
Mahadevan (2000)			Logistic Stream		Value Stream	Revenue Stream				
Wirtz (2000)	Combination of production factors for strategy implementation	Core competencies & Core assets		Market & customer segmentation	Service offer & Value proposition	Systematization of revenue forms	Combination & transformation of goods & services	Production factors & Suppliers	Financing & Refinancing	
Hedman/Kalling (2002)	Managerial and organizational, longitudinal process component	Resources		Customers	Competitors, Offering		Activities & Organization	Factor & Production Input Suppliers		
Bouwman (2003)		Technical architecture		Customer Value of Service					Financial arrangements	
Afuah (2004)	Positions	Resources			Industry Factors		Activities		Costs	
Mahadevan (2004)				Target Customers	Value Proposition	Revenue Model	Value Delivery			
Voelpel/Leibold/Tekie (2004)		Leadership capabilities	Value Network (Re)Configuration for the Value Creation		Customer Value Proposition					
Yip (2004)	Scope, Differentiation	Organization		Nature of Customers, Channels	Value Proposition, Nature of Outputs		How to transform inputs (including technology)	Nature of inputs		
Lehmann-Ortega/Schoettl (2005)					Value Proposition, Value Architecture	Revenue Model				
Osterwalder/Pigneur/Tucci (2005)		Core Competency	Partner Network	Target Customer, Distribution Channel, Relationship	Value Proposition	Revenue Model	Value Configuration		Cost Structure	
Tikkanen et al. (2005)	Strategy & Structure		Network				Operations		Finance & Accounting	
Al-Debel/EI-Haddadeh/Avison (2008a)			Value Network		Value Proposition, Value Architecture				Value Finance	
Demil/Lecocq (2010)		Resources & Competences, Organization			Value Proposition	Volume & Structure of Revenue Streams			Volume & Structure of Revenue costs	
Johnson (2010)		Key Resources			Customer Value Proposition	Profit Formula	Key Processes			
Osterwalder/Pigneur (2010)		Key Resources	Key Partners	Customer Relationships, Channels, Customers Segments	Value Proposition	Revenue Streams	Key Activities		Cost Structure	
Intensity of use										

Very low  
 Low  
 Moderate  
 High  
 Very high