

Analysis of Design Science Research Methodology and Entrepreneurship Connections

Summary of dissertation for the degree of Master in Information Systems and Computer Engineering

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ABSTRACT

Business models matter for the success of a company. Unfortunately, the market and the needs of the customer tends to change rapidly, possibly making the business model to be outdated, in which can be enough for the company to fail.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 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 for business model innovation. The 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 related to are of entrepreneurship and business model innovation.

Keywords

Business model, Business model innovation, DSRM, Business Model Canvas, Business Model Generation, Design Science.

1. INTRODUCTION

Nowadays a business model matters for the success of company (Magretta, 2002), and it is being given more relevance on the research 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).

But one of the key issues is that startups tend to not have an innovative business models, because they do premature scaling (Marmer *et al.*, 2011). Due to that phenomenon, 70% of the technological startups that were analysed in the Startup Genome Report failed (Marmer *et al.*, 2011). It was identified two solutions that were intended to solve the startup failure. One of them was The Business Model Design Framework for Viability but one of the issues was that it was not applied in real cases (Souza *et al.*, 2015), and the other solution was The Lean Start-Up which was applied in real cases (Ries, 2011), but did not have delineated activities in each step of the process.

Therefore, the artifact proposed is going be the DSRM (Peppers *et al.*, 2007), which will be described in section 2.3, integrated with the activities of Business Model Generation (Osterwalder and Pigneur, 2010), which will be described in section 2.1. Each phase 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 have a background and practice entrepreneurship or business model innovation and know about the scientific process. 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 reached the final proposal.

1.1. Problem

Research into business models has been showing that business models matter for the success of the company (Magretta, 2002). The success of a company can be by being the one that has the best financial results, or the one that brings the most value to the market (Osterwalder and Pigneur, 2010). But most companies end it up not

maintaining a good financial performance or value capture to their consumers after one or two years, because in that period the market and customer needs change, making the business model outdated (Chesbrough, 2010).

There is a related term called premature scaling that has been identified as a potential factor that causes startups to fail (Marmer *et al.*, 2011). This term was identified based on the analysis of 3200 technological startups, and startups enter a state of premature scaling when one of their 5 dimensions of the behavioral stage is more developed than the actual stage of startup (Marmer *et al.*, 2011). Figure 1 shows that inconsistent startups, which suffer from premature scaling, 93% of them do not pass the 100K mark of revenue per month, causing 70% of startups to fail.

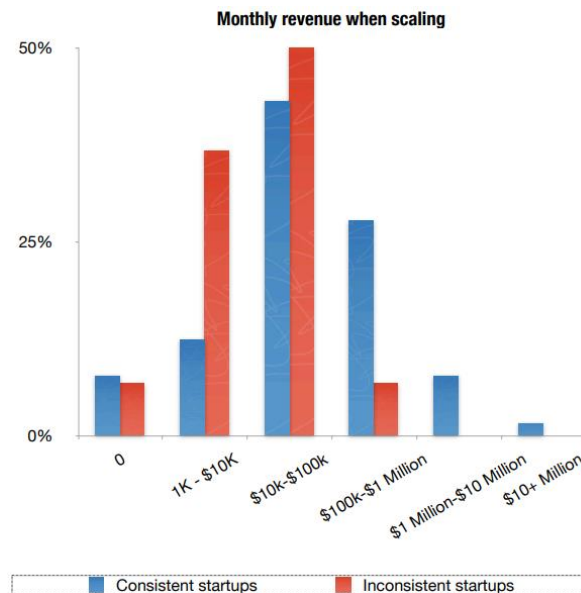


Figure 1 - Monthly revenue when scaling (Marmer *et al.*, 2011)

There are two approaches that have been identified as being a possible solution to help solve this issue. The Business Model Framework for Viability approach allows the generation of business models that are feasible and that takes into account the changes of the market, in order to create a business model that will last a long period of time (Souza *et al.*, 2015). The problem with this framework is that it was still not tested in real cases. The other approach is The Lean-Startup which is an iterative cycle based on the scientific cycle (Ries, 2011). The positive aspect is that it has been used in real cases, but it does not specify the activities to be executed in each step of the cycle, leading the practitioners to perform an inconstant number of cycles until they reach an innovative business model.

The problem still remains: The percentage of companies that fail is high. A more scientific and structured approach is required for the generation of innovative business models (Wirtz *et al.*, 2016). DSRM is a scientific approach to generate models (Peffer *et al.*, 2007), and because business models can be considered as models (Baden-Fuller and Morgan, 2010), it will be investigated the possibilities of using DSRM for the generation of business models. So, the question that arises for this investigation is: **Which are the contributions of DSRM in the generation of business models?**

1.2. Research Methodology

This research will be theoretical and aims to expand the current body of knowledge of the theme of business model innovation. The research will follow the Design Science paradigm, using the build and evaluate loop. Build and evaluate is a Design Science method designed to create new artifacts that add value or have a utility. The idea is to go through the cycle iteratively and refine the artifact until a final artifact is proposed (Markus, Majchrzak and Gasser, 2002). The possible artifacts that exist when doing research are constructs, models, methods and instantiations (March and Smith, 1995).

In section 1.1. the problem, the motivation and the research question are identified. In section 2 it is talked about the previous solutions that tried to solve the problem, and in section 3 it is defined the proposal that will solve the problem. All these previous sections are part of the build phase.

Section 4 discusses the evaluation, its objectives, and the various iterations that have taken place. In section 5 discusses the lessons learned from this research, limitations, and future aspects to be investigated. All these previous sections belong to the evaluate phase.

2. Related Work

In this section will be reviewed in section 2.1 Business Model Generation, speaking of all the constituent components. In section 2.2 it is reviewed The Lean Start-Up, giving emphasis on the Build-Measure-Evaluate Feedback loop. Section 2.3 it is reviewed the Design Science Research Methodology. And section 2.4 it is done a critical analysis and comparison of the three previous solutions.

2.1. Business Model Generation

It is a book written by Alexander Osterwalder & Yves Pigneur that delivers a model and various activities to help design a business model (Osterwalder and Pigneur, 2010). The model that the authors created to describe the rationale of the business is called Business Model Canvas, which consists of 9 Building Blocks: **Key Partners (KP)**, **Key Activities (KA)**, **Key Resources (KR)**, **Value Proposition (VP)**, **Customer Relationship (CR)**, **Channels (CH)**, **Customer Segment (CS)**, **Cost Structure (C\$)** and **Revenue stream (R\$)**.

The authors also define possible dynamics that a business model can have which are based on existing business concepts such as: **Unbundling**, **The Long Tail**, **Multi-Sided Platform**, **Free** and **Open Business Model**.

In order to create a new business models, and make it more unique, the Business Model Generation proposes techniques such as: **Customer insights**, **Ideation**, **Visual Thinking**, **Prototyping**, **Storytelling**, and **Scenarios** to foster the generation of new business model ideas and solutions.

When business models are created, it is necessary to assess their performance against the current needs of consumers and also the market, and whether or not there is a conflict between business models of the same company, so that the business model can be improved in future developments. For this, Business Model Generation proposes the activities: **Business Model Environment**, **Evaluating Business Models**, **Business Model Perspective on Blue Ocean Strategy** and **Manage Multiple Business Models**.

Business Model Generation proposes a process to guide practitioners on the development of their business model. It consists of the **Mobilize**, **Understand**, **Design**, **Implement**, and **Manage** phases. These steps are not necessarily to be followed in order, but usually the Design and Understand phases run in parallel.

Business Model Generation is not only useful for designing business models but can also be adapted to be implemented in an IT architecture where it has 3 layers: the top is the business layer, the middle layer is the application layer, and the bottom is the technology layer.

2.2. Lean Start-Up

The Lean Start-Up is a book that shows a new way to develop startups. Startup is defined as an organization that develops a product or service in conditions of extreme uncertainty. The metrics that define whether a startup will succeed is how fast and how much knowledge a startup can generate. To generate this knowledge, Lean Start-Up proposes the Build-Measure-Evaluate Feedback loop, which is a loop based on the scientific method, and has an engine of growth that is the foundation from which all actions will be taken.

2.3. Design Science Research Methodology

Figure 2 represents this methodology, and it is used to generate artifacts in information systems that solve an instance of a problem. It consists of a 6-step cycle, where the first step of the the cycle is to define the problem and its motivation. In the second step the objectives of the solution are defined, then in the third step, the solution is developed. After the solution is developed, in the fourth step, the solution has to be applied in a concrete case of the problem. When applying the artifact in the concrete case, results are generated in which they will be evaluated with relevant metrics in order to be compared with the defined objectives, and that is part of the fifth step. If the evaluation is conclusive, the sixth step is to communicate the artifact to relevant entities that have knowledge on the research topic in meetings or conferences. If in the evaluation, the results were not enough to come to a relevant conclusion, it returns to the step of setting of objectives, or drawing of a new solution.

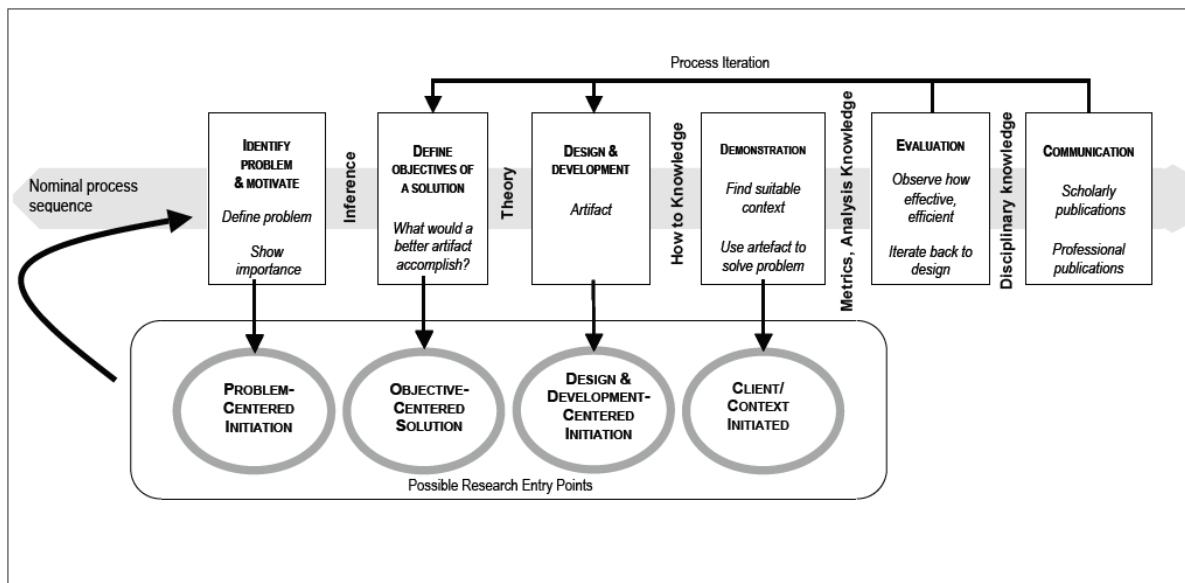


Figure 2 - DSRM process (Peffer *et al.*, 2007)

This cycle can be started in one of the four steps. You can start in the Problem, the Objective, the Solution development, or the Demonstration steps.

2.4. Critical Analysis

Taking into account DSRM, Business Model Generation and The Lean Start-Up solutions, there are some aspects that are common among them. All solutions present the process to be performed, generate an artifact, are cyclical processes, create new knowledge, and Lean Start-Up and DSRM follow the scientific method. Then there are aspects that make each solution unique in which will be important to take into account to integrate into a novel proposal, as is the case of DSRM that has the 4 possible ways to start the investigation and is the case of Business Model Generation that presents several activities which can be used to conceptualize concretely the business model.

3. PROPOSAL

In this section it will be explained the proposed solution for the research question that was identified in the section 3.

3.1. Objectives

It was seen in the critical analysis that Lean Start-Up and DSRM have a process that is behaviorally similar to the generation of knowledge. This opens the possibility of the DSRM being used to generate knowledge in the scope of entrepreneurship, namely in the generation of new business models. To generate business models, the DSRM has to perform certain activities that are designed to accomplish that purpose. In this investigation will be used the Business Model Generation activities. Therefore, the purpose of this research will be to **map Business Model Generation activities in DSRM**.

3.2. Definition

The solution proposed is a **DSRM approach to the generation of business models**, where the Business Model Generation activities will be mapped in the DSRM steps, as it can be seen in Figure 3. This solution is intended to be applied in the context of startups at the beginning of their life cycle and that are part of the technology industry.

3.2.1. First step: Problem definition and motivation

In the DSRM problem phase, in a scientific context, a problem has to be identified that the previous literature has not yet solved, and going back to the market context, previous literature can be considered solutions that have already been conceived or needs of the consumers that have already been solved. In order to identify a problem in the business context, it is necessary to understand what is going on with the consumer, and also what is happening with the market. Using the **Customer Insights** and **Business Model Environment** activities, it will be able to gather the information that is needed to serve as motivation for the problem that is identified.

3.2.2. Second step: Objectives

In the second step of the DSRM, it has to be defined the objectives of the solution to the defined problem. In a business perspective, this means defining what kind of behavior is considered appropriate for the business model to address the defined market problem. This will be mapped with the **Business Model Patterns** activity.

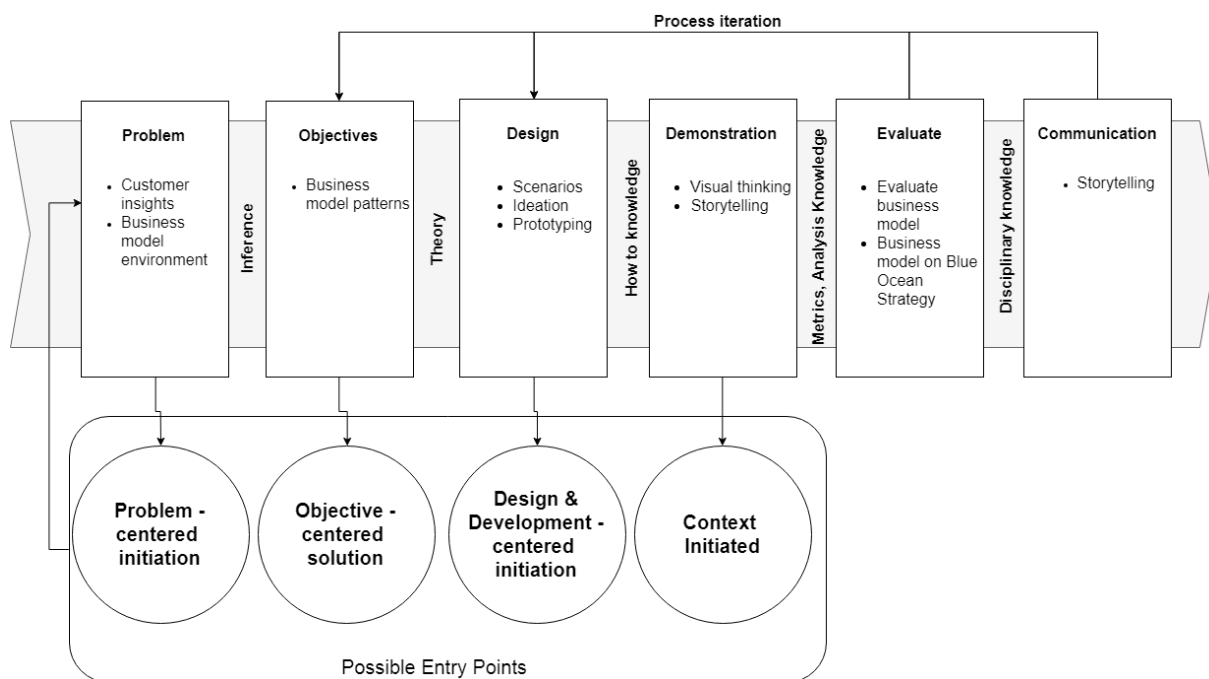


Figure 3 - DSRM approach to the generation of business models

3.2.3. Third step: Design

In the third step of the DSRM has to be designed the solution that will solve the problem. The solution can be a construct, model, method, or instantiation. As the artefact is a business model, the artefact is embodied in the model category. In this step, the **Scenarios**, **Ideation**, and **Prototyping** activities of the Business Model Generation will be mapped in this step because it has to be defined the possible scenarios that exist in the market and also the type of customer, then brainstorm and filter the best business models, and then experiment the business models with different functionalities.

3.2.4. Fourth step: Demonstrate

In the fourth step of DSRM, it must be demonstrated that the solution solves an instance of the identified problem. In this context, the artifact is a business model, so the startup has to market the product or service of the defined business model. This implies that the startup not only has to show the product to the customer, but also has to communicate to the workers and partners how the product of the business model works by using the **Storytelling** activity to help communicate the main idea of the product to employees, partners and consumers.

3.2.5. Fifth step: Evaluate

In the fifth step of the DSRM it is necessary to evaluate the business model and compare the results of the evaluation with the objectives initially defined. For this purpose, it is going to be mapped the activities **Evaluate Business Models** and **Business Model on Blue Ocean Strategy**, because they are two activities that evaluate in detail each building block with the performance that was generated after the demonstration.

If the evaluation results are acceptable then it is moved on to the next step, otherwise it is necessary go to objective step and define a different business model pattern, or have to design a new business model.

3.2.6. Sixth: Communicate

In the sixth step of the DSRM it has to be communicated the artefact and the results of the investigation to audiences that are related to the theme. In the case of the business this means that the startup will communicate

its business model and product to audiences such as investors, or new customers. And to do this communication effectively, the **Storytelling** activity is executed.

After the sixth step is completed, the business model innovation process is finished. But it is important that the process starts again, as new market or consumer needs can change. So the cycle can start again in the problem, objective, design, or demonstration phase.

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 going to be explained how the evaluation was executed in order to achieve the objectives in section 4.1.

4.1. Objectives

One of the objectives of the evaluation of the artefact is to collect quantitative and qualitative data on the mapping of Business Model Generation activities in the DSRM steps to practitioners who do and have knowledge of the fields of entrepreneurship or business model innovation. By collecting data in these two ways, it will be able to have a clearer idea of the practitioner's assessment of the artifact.

Another objective of this evaluation is to perform it several times, using the relevant information from each evaluation to refine the artifact.

4.2. Evaluation method

This evaluation was made by interviewing practitioners from the area of entrepreneurship and innovation of business models. From 30 people that were reached through referrals or email, eight of them were interviewed. The first four practitioners were interviewed in the first evaluation, and the following four were interviewed in the second evaluation. The interview process was to incrementally present the artifact to the practitioner, asking in each mapping on a scale of 1 to 5 the level of agreement that the practitioner would give and recording the comments that justified his/her choice, and at the end asking what changes he/she would recommend to the artifact.

4.2.1. First iteration

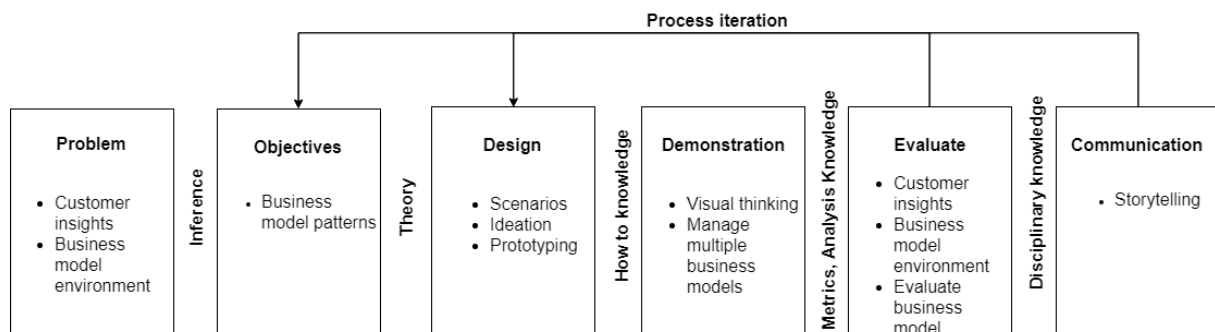


Figure 4 - Proposal first iteration

In this first iteration, the Business Model Generation activities were mapped in the DSRM steps, but without including the 4 possible ways to initialize the problem, and without defining in what context the method would be used. Four practitioners were interviewed, and the average that resulted from all the values that practitioners gave to the mappings was 4, with a pattern deviation of 1.24 which means that practitioners on average agreed on the mappings, and the opinions were a bit diverse.

Considering the results of each mapping, the "Manage multiple business models in the Demonstration step" activity had to be removed because it had an average of 2 and a pattern deviation of 0.8, which reveals that the practitioners disagreed with the mapping and the opinion was not very diverse. It was also considered to remove in the next iteration the activities "Customer Insights in the Evaluation step" and "Business model environment in the Evaluation step" because they had a mean values of 3.5 and 3 respectively, and a pattern deviation of around 2, and 1.8 respectively, which shows that practitioners did not agree or disagree with the mappings but there was a great disparity of opinions.

4.2.2. Second iteration

In this second iteration, it was decided to move the activity "Manage multiple Business Models" to the Evaluation step, add the activity "Business Model on Blue Ocean Strategy" in the Evaluation phase, insert in the

method the 4 possible initiation inputs of the problem, and it was defined that the method would be used in the context of startups as it can be seen in figure 4.

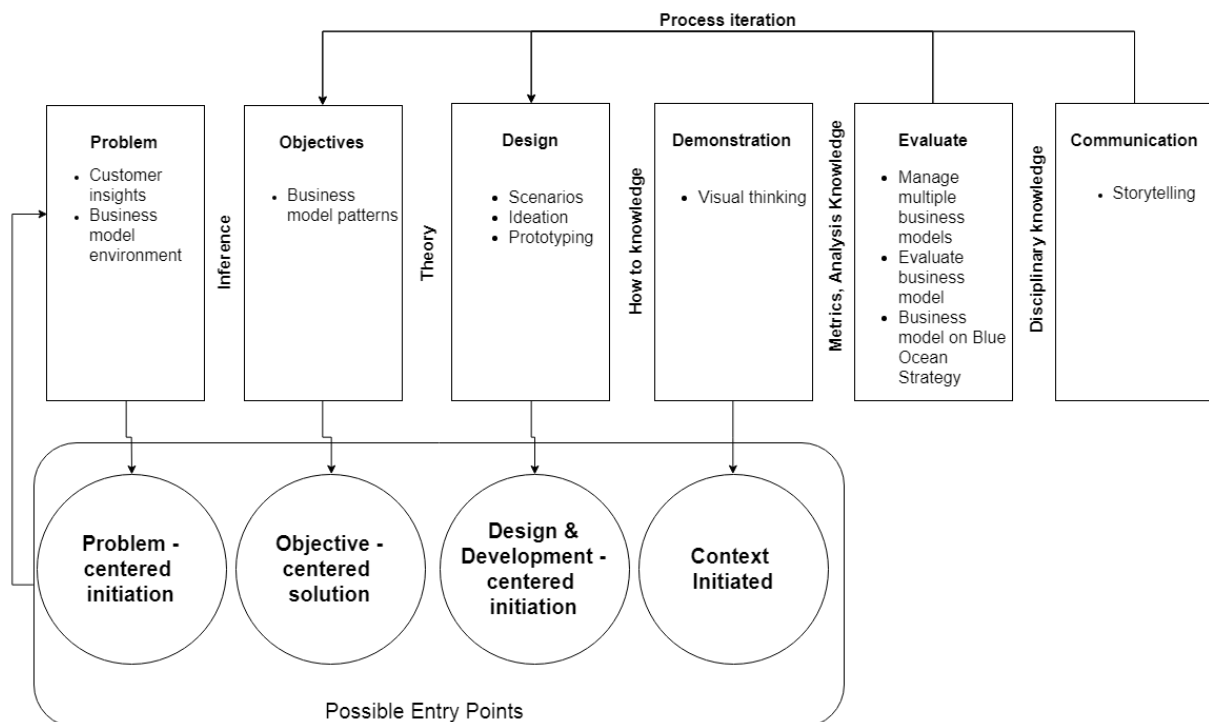


Figure 5 - Proposal second iteration

Four practitioners were interviewed with the same evaluation process, and the mean value of all mappings was 5, with a pattern deviation of 1.19. From the first iteration to the second, there was an increase in the level of agreement among the practitioners and the disparity of opinions was slightly reduced. In order to reduce the disparity of opinions and see if they maintain the same level of agreement, in the final proposal it was removed the mapping "Manage multiple business models in the Evaluation phase" and substituted the mapping "Visual Thinking in the Demonstration phase" with the activity Storytelling.

5. CONCLUSION

This research was important to develop a new method that allows startups to innovate their business models and keep it aligned in every stage of the startups development. Along the two iterations, it was possible to explore what were the Business Model Generation activities that could be mapped in the DSRM to achieve business model innovation. In each evaluation, practitioners have shown to agree with the activities that were mapped in the DSRM, affirming this way that the method can be used for business model innovation in the context of startups that are in an early development. The limitations were that it was not possible to interview more practitioners, the values of each mapping were dependent on the knowledge and experience that the practitioners had on the subject, and also the communication and the understanding of the artifact itself. In the futures, this artifact can be used to do case-studies on startups that use this process, and analyse their performance throughout a period of time and see if their business model stays consistent with their actual situation and also their development. It also opens doors for other models or activities that are related to business model innovation to be mapped in the DSRM in order to improve one the other 4 behavioral dimensions such as Product, Customer, Financials, and Team.

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