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IMPORTANCE OF PROBLEM SETTING BEFORE DEVELOPING A BUSINESS MODEL CANVAS

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1. Introduction

The sucess of an innovative product or service highly depends on its ability to respond to end users' needs and to alleviate their pains. Although it can be argued that some innovations are not pain-driven or need-seeker, need-seeker companies represent the most financially outperforming companies with high level of consistent success according to the Global Innovation report [Jaruzelski et al. 2014]. An innovative design solution must generate economic value for the company, which allows the creation of loyality links with customers. In today's business context, a company evolves in a rather multi-partner environment and performs several activites (such as supply chain, accountability and legal aspects management) to survive and to satisfy its customers. Hence, one might ask how to map and represent a business?

In order to help innovators to model their business functions in a more visual and easy-to-understand and easy-to-share way, various tools have been developed in innovation management research area. A business modeling powerful tool has recently been developed by Alexander Osterwalder and Yves Pigneur. This tool is called the Business Model Canvas (BMC) [Osterwalder and Pigneur 2010]. In his PhD research in management information systems [Osterwalder 2004], Osterwalder performed an exhaustive review of the literature on business models. He then tested and validated the BMC with entrepreneurs, which is now used by more than 350,000 people around the world [Osterwalder 2015].

Business Model Canvas is a relevant tool to describe and to manage a business departing from the idea of a design solution (called Value Proposition). A lot of applications of the BMC can be observed among innovative startups that are seeking investors and partners to develop their products and services. Indeed, the BMC creates a common language between design team members as well as between the company and external stakeholders (e.g. investors and suppliers). The ease of use of the BMC makes it convenient to be adapted in early design stages. However, a major question at this stage remains to be answered: is the design solution really able to alleviate important pains or sufferings of end users?

In this paper, we emphasize, prior to the use of the BMC, the importance of problem setting (i.e. defining a design problem to be solved) in front end of innovation to radically innovate. After discussing the context of the Business Model Canvas usage in section 2, the methodology of this research work is described in section 3. In section 4, the failure reasons of a premature use of the BMC tool is discussed through real examples of innovative startups in Paris area. Section 6 draws the importance of exploring a useful design problem prior to the application of the business model tools. This paper ends with the statement of three main rules to follow when one wants to use the Business Model Canvas.

2. Context of BMC usage in the design of innovative solutions

The BMC as illustrated in Figure 1 contains 9 blocks (i.e. Customer Segments, Value Proposition, Customer Relationship, Channels, Key Activities, Key Resources, Key Partners, Cost Structure and Revenue Streams), which aim at harnessing emerging ideas around the business in brainstorming sessions. On each of the 9 blocks and on a single page view, designers can write, mainly on sticky notes, key ideas in a more opportunistic way. The business interrelationships can be discovered or developed and a big picture of the business to be implemented is provided.

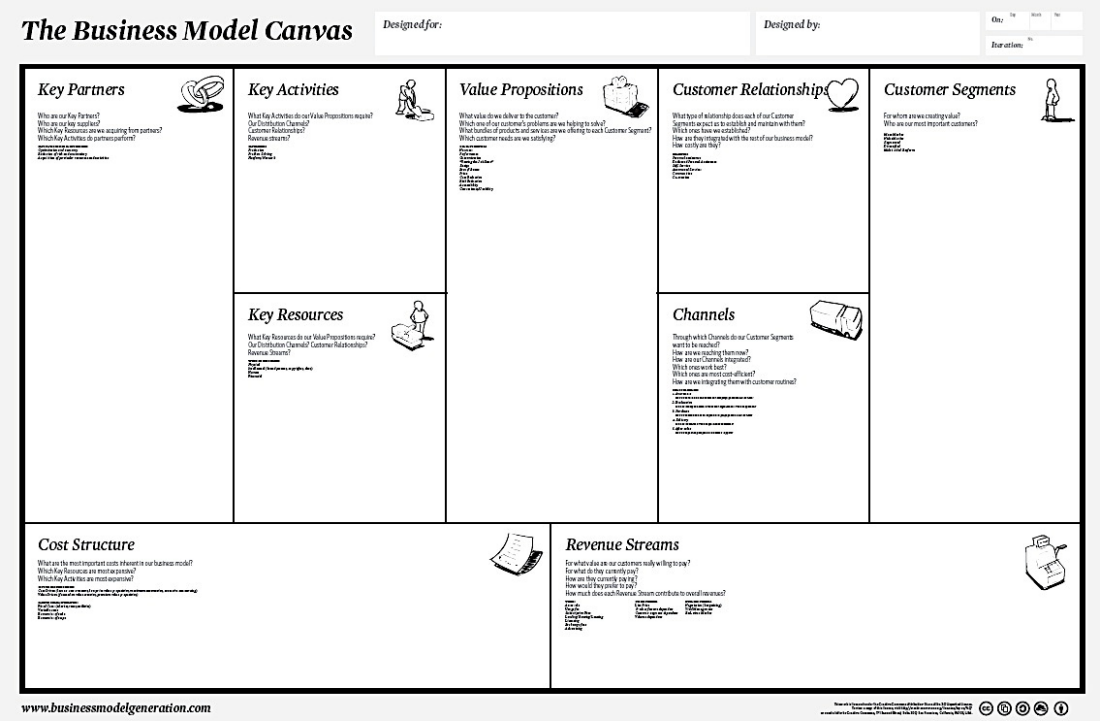

Figure 1. Business Model Canvas [Osterwalder and Pigneur 2010]

This tool has facilitated an exhaustive representation of a business comparing to Porters 5 forces model [Porter 1985] or SWOT analysis (standing for Strengths, Weaknesses, Opportunities and Threats). The BMC provide a simple and intuitive tool that can be developed quickly and applied to iterate and verify the company's business strategy. At the heart of the BMC, the Value Proposition represents a central pillar around which other blocks evolve. The Value Proposition determines the core behaviours and activities of a given business.

A recent publication by Osterwalder et al. [2015] refines the mapping of value proposition and customer segments and the fit or matching between value proposition and segments of customers (see Figure 2). A customer profile is defined by three components: pains, gains and jobs. A value map is composed of pain alleviators, gain creators and job contributors.

It is obvious that the BMC and Value Proposition tools are useful to develop and manage a business. However, going directly to the BMC development without questioning systematically the "design problem" relevance could lead to failures. Random and uncertain problem identification, following for instance empathic design approaches, is not enough to prove the legitimacy of the design problem.

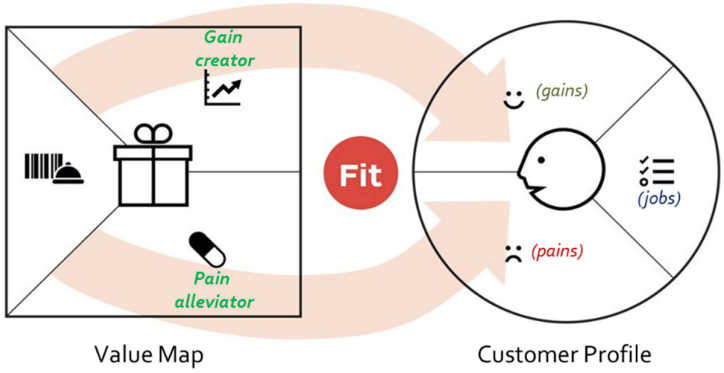

Figure 2. Designing the fit between a customer profile and value proposition [Osterwalder et al. 2015]

3. Research methodology

This research is a result of numerous semi-structured interviews with innovative startups in Parisian incubators. 60 startups in various fields mainly related to urban challenges (such as healthcare field, clean technologies and urban furniture) have been interviewed. This sample of 60 startups is identified according to their fields of application as well as their capacity to communicate their real life experimentations results. The qualitative and quantitative collected data have allowed the creation of a database over startups practices in terms of value proposition design and test. Incubation and experimentation experts at the City of Paris have then validated the reliability of the collected data. We seek in this research, through examples derived from conducted interviews with startups, to identify the reasons of business failures when the BMC is not used following a rational design attitude. Subsequently, the importance of a relevant problem setting prior to the use of the BMC is explained. Finally, three recommendations are formulated to avoid possible failures in the design process by using the BMC.

4. A premature use of the BMC can lead to failure

Let us first take few examples of innovative startups that used the BMC in early design stages or that were able to illustrate their business functions through this tool from the very beginning design stages. In the following, two design solutions developed by innovative startups will enable to demonstrate that a premature focus on business functions can lead to failure. Furthermore, the reasons of these failures are detailed.

These examples are derived from our observations and diagnoses over the real life experimentation projects conducted by innovative startups in the city of Paris, France. The first company designed and prototyped image/voice recognition box (see Figure 3), which enables to create social links between elderly people living in a retirement institute and also by alleviating the pain of loneliness of the elderly. The box works with card games containing RFID tags that are used by nurses in retirement homes and it recognizes also a predefined image in order to call the person on the photo via a landline. These first two functionalities are designed to stimulate cognitive functions in order to prevent Alzheimer disease. In addition, the box enables the coordination between healthcare assistants and detects falls and physical abnormal postures.

Figure 3. Image/voice recognition box for creating social links for the elderly

The startup, established by senior experts in gerontology, won three national innovation awards since its creation for a total of tens of thousands euros of seed capital. Public and private funders were thus convinced by the potential of this business, clearly presented on a business model canvas. Nonetheless, once the finalized prototype was brought to real life tests in retirement homes of the City of Paris, an unfortunate situation occurred: only 2 illiterate elderlies among 50 residents were capable to test the solution, i.e. a lack of usefulness of the design solution was observed but in a very late design stage. Few months later the company was completely dissolved. At the end of the company's life cycle, the founder has developed several new features in the hope of covering several painful situations for end users. However, important effort was devoted to the networking and lobbying actions without providing relevant proofs regarding solution's usefulness as well as its perceived innovation by end users (i.e. elderly people) instead of customers (i.e. retirement homes) or purchasing advisors (National healthcare actors).
Another example is an innovative startup in the field of street furniture. This company produces street bike lockers (see Figure 4). Citizens can lock their bikes in vertical position and the whole locker can be easily installed on the public space. The first installed prototype at the city of Paris had a black body and was perceived as too dark by Parisian citizens and tourists. The company had to reproduce another prototype with transparent plates, which was costly since the company had already produced several boxes.

Figure 4. Urban vertical bike lockers

The analyses of 60 urban-centered innovations have led us to establish statistical models to identify the most likely causes of low efficiency of design solutions in the context of experimentation projects carried out in Paris. A part of this result is also statistically proved by the comparison of expected and obtained UNPCS innovation proofs, inspired by the works of [Zimmer et al. 2012], [Yannou et al. 2015], [Yannou et al. 2016] through experimentation projects of design solutions in the field of clean technologies.
UNPC stands for Usefulness, Newness, Profitability and Concept. The usefulness represents the coverage of usage and needs situations of users/stakeholders for which important needs are covered. The proof of newness is related to both perceived newness by urban value beneficiaries and also the usage newness, where urban stakeholders are not educated or sensitive to this innovation. The proof of profitability embeds expected profitability for the company as well as for customers or users. The proof of concept is related to the ability of the UrCI solutions to work effectively and efficiently in expected situations. Authors in [Bekhradi et al. 2015] proposed a fifth proof (S: Stakeholders network), which is added to UNPC set of proofs to stress the importance of weaving links with other stakeholders mainly in the context of innovative startups.
In [Bekhradi et al. 2015], the UNPCS analysis of expected and proven proofs (before and after real life experimentations) demonstrated that in the case of *in vivo in situ* experimentation projects, the less explored proof remains the proof of Usefulness (see Table 1). The statistical study has been done on the basis of the startups declaratives on the degree of importance of each UNPCS proofs before and after the *in vivo in situ* experimentations. After performing statistical tests on the before-and-after quantitative data, it has been demonstrated that the proof of Stakeholders network is the most significant one. In a nutshell, our observations among startups through semi-conducted interviews showed that the opportunity of experimenting a design solution in real life situations is mostly used by startups as an opportunity to do lobbying and networking with public and private stakeholders. However, the literature related to real life experimentation (see for instance [Thomke 2003]) emphasizes that the

experimentation represents an opportunity for learning from design solution's robustness in terms of UNPC rather than networking with stakeholders.

Table 1. Statistical comparisons between expected and obtained UNPCS in the case of real life experimentations of innovative solutions [Bekhradi et al. 2015]

Proof type	Proof of Usefulness (U)	Proof of Newness (N)	Proof of Profitability (P)	Proof of Concept (C)	Proof of Stakeholders Network (S)
Statistical p-value	0,36	0,022	0,028	0,044	0,019

The lack of exploration in terms of usefulness and newness proofs explains thus the low efficiency of real life experimentation projects. Indeed, the question of usefulness and newness of the design solution is not even raised by an important number of startups willing to experiment. In reality, much of the entrepreneurs' effort, in these experimentation projects is focused on making themselves known and creating a "buzz" around their company and solution. They seek also to create partnerships with public and private stakeholders in order to raise financial funds and to develop their design solution.
Startups are indeed concentrated on developing a canvas of stakeholders (S proof) and businesses around their value proposition, which is not necessarily robust enough. Their interpretation of the interest of real life experimentations and their role in improving the design solution is unfortunately distorted. Their business model canvases are developed without systematically asking the question of whether the value proposition matches with the needs, pains and expected performances of end users or of other value beneficiaries and if so, to what extent.
These observations fall within the obtained results of a study [Elton-Pickford 2013] over the failure reasons of ten large international companies (including Kodak, Moulinex and Bic perfume). In this study, the BMC tool is used as an investigation basis to identify the major reasons for failure of these companies. The first and most important failure reason is identified as the lack of matching between value proposition and customer segments. Thus, the value proposition does not really contribute to solve a problem or satisfy a need. This non-matching or mismatching between the value proposition and customer segments of the BMC can be described as the lack of problem exploration and usage investigation in front end of innovation.
Investigations done among 60 Parisian startups confirmed that the general trend among innovative companies and startups is to start with an idea of solution or at best, with an idea of problem, which is not well explored. This attitude can lead designers to an unsuccessful design to the market although the business canvas has been well presented and allowed somehow to convince stakeholders (e.g. investors or public funders) to develop the solution. Indeed, the BMC tool is widely used by these startups in order to communicate over their design solutions, customers and other aspects of their design solution. In spite of intuitive and clear BMC presentations by these startups, the real life tests showed that the solution does not contribute to efficiently alleviate a pain or to create a gain. The sticky notes containing entrepreneurs' or designers' ideas pasted on value map or the BMC are not really founded upon realistic and robust proofs.
On this basis, even if the BMC is a relevant tool for business development, several shortcomings of its usage in early design stages must be specified:

- It is not obvious to set priorities when one wants to design a solution aiming at alleviating users' and customers' pains. Where to start inside the BMC to radically innovate?
- There are not enough evidences provided by participants of design brainstorming sessions that the ideas expressed on sticky notes are value creator. How to verify and validate the legitimacy of these ideas? And most importantly, how to make sure that the problem is well identified and evaluated?
- A given value proposition cannot be assessed in terms of its value creation. How to judge whether a value proposition alternative is better than another? How to nourish the perception of value offer and customer segmentation?

Consequently, developing directly a BMC is not a secured way of designing a product or service since the above-mentioned points must be addressed prior to any business model development. There are methods and approaches enabling to fill in the BMC blocks in a more robust way by identifying end users' problems and needs prior to the BMC development.

5. Importance of exploring a useful design problem prior to the BMC development

In design engineering literature, a lot has already been developed to address the problem identification question and its importance in design process. TRIZ methodology [Savransky 2000] or the "theory of inventive problem solving" advocates tools to perform cause-effect analyses starting from existing products. However, TRIZ methodology does not take into account end-users contexts and the contextual efficiency of existing solutions. TRIZ is less oriented in the identification of need opportunities and is rather focused on problem solving with the help of forecasting tools derived from the study of patterns of invention in the global patent literature. Another design problem identification approach is the Quality Function Deployment (QFD) [Akao 1994] tool and the matrix flow that has been widely used in data driven projects from qualitative user needs to product and process parameters. However, these matrices enable to store an important quantity of data without necessarily generating innovative insights. In addition, Kansai engineering represents another design engineering method aiming at developing products and services by integrating customers' emotions and feelings to model properties and characteristics of a product or service. However, this method does not provide guidelines to identify and evaluate users' needs and pains.

Several design processes or "ways of thinking" are generally used by design studios and workshops. Design thinking consists in iterative loops starting by an empathy with the audience of the solution. It embeds thus from the early design stages the idea of a solution and focuses then on experimental trial and error loops. The relevance of this approach in terms of broad useful problem identification is not proven, since the problem setting and exploring are not done following a systematic process.

The Radical Innovation Methodology (RID) [Zimmer et al. 2012], [Yannou et al. 2013b] indicates that this sporadic problem setting process can be rigorously structured and lead to the identification of a worthy problem for which existing design solutions are not effective. The RID methodology provides relevant proofs to monitor the design process and offers problem evaluation tools by crossing usage situation, Users and their pain and gains. RID enables to assess "value buckets" [Yannou et al. 2015], which prove that there is quantity of unsolved problems or poorly solved ones which are not covered by the existing solutions. The latter falls within the scope of the Blue Ocean marketing strategy [Kim and Mauborgne 2005], where a radically innovative solution can be differentiated in terms of essential value creation comparing to the existing design solutions. Thus, the RID methodology puts forward a more substantial useful problem exploration in front end of innovation. The business functions development appears in later design stages once the design problem is well founded.

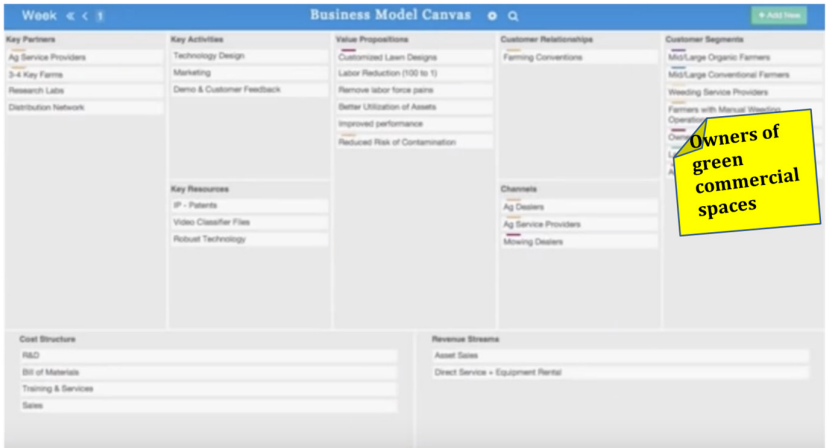

Figure 5. First BMC developed by Stanford student [Bluerivert 2014]

To better illustrate the importance of problem exploration prior to business model development, the profile of a real innovative startup is described in the following (this description derives from innovation management literature). Two Stanford engineering students had the idea of building an autonomous lawnmower for golf courses. They first started to fill in a BMC (see Figure 5) by being convinced that the Customer Segments block is sufficiently consolidated.
Before launching the business, they decided to "get out of the building" and observe usage situations and users' pains and needs. They began to investigate pains of farmers and found out that important pains are not alleviated by the existing solutions in the case lettuce thinning. Thinning lettuce fields is a painful and tough task for farmers (see Figure 6) who have to hire illegal workers to accomplish this difficult task. Based on the identification of this painful problem, the value proposition called Blue River Technology have managed nine months later to raise more than 3 million dollars in venture funding [Blank 2013]. The company is currently making millions of dollars of turnover.

Figure 6. Blue River precision lettuce thinning technology to alleviate farmers' pains

The inspiring example of Blue River Technology demonstrates that even in the case where the entrepreneurial team were perfectly able to fill in the BMC, they had to quickly switch or pivot to another value proposition idea after an extensive design problem exploration.
In the following, three guidelines or rules that need to be respected are proposed in order to optimize the use of the BMC without forgetting the importance of problem identification.

6. Proposition of guidelines for a wiser use of the BMC

Three guidelines or rules to respect are identified following the field observations and literature review. The idea behind these rules is to robustify the design process of innovative products and services.

6.1 First rule: Identify and evaluate the design problem, before developing the BMC

A large problem exploration must be done beyond trial and error loops of design thinking approach. This exploration must follow a set-based way of thinking [Yannou et al. 2013a], which emphasizes the importance of collecting as much design information as possible in front end of innovation.
It is important to first robustify the usefulness of a design solution and also to measure usage segments by crossing usage scenarios with users' pains and gains and finally to evaluate the size and importance of each segment (cf. usefulness simulation). This allows investigating value buckets (i.e. worthy problem chunks which are not covered by the existing solutions).

6.2 Second rule: Use of the BMC in 3 steps (once in problem setting and twice in problem solving phases)

This attitude will help to save more time in problem solving phase since the problem is well founded. It enables to reduce waste in time and resources initially foreseen for trial and error loops on a prototype, which does not create social and economic value and does not contribute to any pain alleviation.

1. In the problem setting phase, the pains and gains of users are identified and crossed with their usage situations. Then the relative effectiveness of the existing design solutions in these painful usage situations is measured. This can be done through value bucket identification developed in the framework of the RID methodology, which can be quantified by the use of dependency structure matrices [Yannou et al. 2015] (see Figure 7).

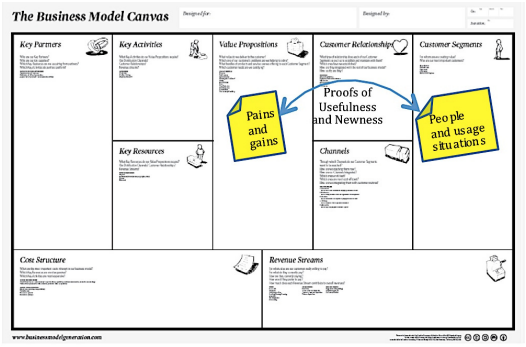

Figure 7. Using the BMC in three steps: Problem setting (RID value buckets)

2. In the problem solving phase, it is first recommended to investigate and experiment the matching of the value offer with the targeted value buckets (i.e. combinations of users, usage situations and poorly or unalleviated pains) (see Figure 8).

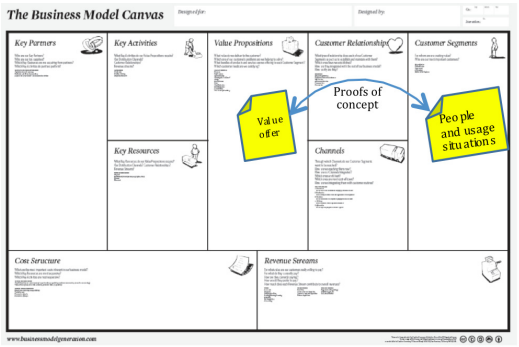

Figure 8. Using the BMC in three steps: Problem solving (experimenting on value offer concept in targeted usage situations)

3. Once the robustness of the value offer is validated, it is now possible to develop the rest of the BMC blocks (still in the problem solving phase). The design and experimentation of a value chain of stakeholders and activities is now more efficient since the value offer is relevant and contributes to alleviate users' pains and respond to their needs (see Figure 9).

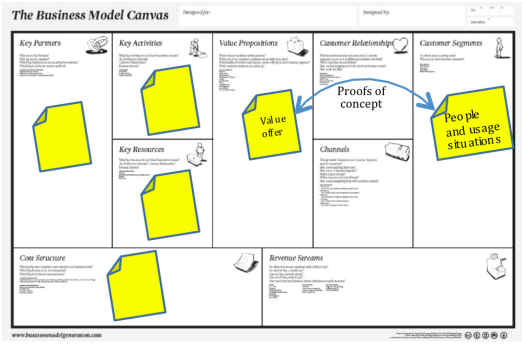

Figure 9. Using the BMC in three steps: Problem solving (designing and experimenting other aspects of value chain)

6.3 Third rule: Advance progressively in a secure way following a problem and solution systematic experimentations

After identifying proofs to enhance different locations of the BMC, one could design roadmaps of experiments to test efficiently and economically sets of proofs to robustify. Experimentation of the

design problem could be done by “getting out of the building” following a lean and customer development approach [Ries 2011]. The use of organized observations based on a more need-seeking innovation strategy is recommended. Besides, designers must systematically keep track of the collected data over users’ pains, expected performances, usage scenarios as well as over the existing solutions. The design of experiments [Fowlkes and Creveling 1995] represents an efficient statistical approach to relate both input problem and solution variables on the one hand and the output parameters of the problem or solution on the other.

7. Conclusion

The Business Model Canvas (BMC) is a relevant tool for business development and representation. It enables creating a common language between entrepreneurial team members and other external stakeholders. However, the use of this tool in early design stages may turn it into a counterproductive tool. Examples of 60 observed startups that experimented their design solutions in real life situations allowed demonstrating that the most important failure reason is generally due to the lack of useful problem exploration. This paper put forward the importance of useful design problem identification prior to any business model development. Three recommendations were formulated to advocate a better use of the BMC providing that a particular focus is brought to the problem setting phase. Our further researches will address the following question: How to use scientific experiments on the design problem and keep track of information and collected data?

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