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Designing business model tooling for business model exploration: An experimental design for evaluation

Research in progress

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Abstract Disruptive technologies drive enterprises to rethink how to create and capture value by revising their business models (BM). Even in cases that the need for BM innovation is clear, how entrepreneurs can do it and what they need to be changed it is not always obvious. That leads to the need for BM exploration. BM tooling can support this process, however, existing BM tools are not widely focused on the BM exploration. In previous steps of our research, we designed and developed a digital tooling for BM exploration. This RiP paper presents the experimental design we plan to use to evaluate the effects of the tooling on the BM exploration. Initial results and future steps are discussed. We expect to contribute to the BM literature by understanding what features of BM tooling contribute to BM exploration.

Keywords: • Business model experimentation • Business Model tooling • Experimental design • Business Models •

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1. Introduction

Digital technologies are radically changing businesses (Bharadwaj, et al. 2013), and that forces enterprises to reinvent and reconsider, their existing Business Model (BM) (Sonsa et al. 2010; De Reuver, Bouwman and Maclnnes, 2009).
One potential solution to support enterprises with radical changes is to do BM exploration. With BM exploration, enterprises can discover new BM opportunities (De Reuver et al., 2016). During BM exploration enterprises are able to create BM alternatives and changes, (Cavalcante, Kesting and Ulhoi, 2011), conceptualize these changes (Sonsa et al. 2010) and assess what could happen under a range of different decision choices (Bisbe and Malagueño, 2012).
Within information systems (IS) research, BM is an emerging topic (e.g., Cosenz and Noto, 2017; Roelens and Poels, 2015; Fritscher and Pigneur, 2014; Kyriazis and Varvarigou, 2013; El Sawy and Pereira, 2013; Bouwman, De Vos, and Haaker, 2008). Special focus is paid on the BM tooling (e.g., De Reuver et al. 2016). However, the potential benefits of BM tooling are still overlooked (Eppler Hoffmann and Bresciani, 2011). Existing tooling is still not formally supporting the exploration of alternative BMs in a structured way. In previous steps of our research, we developed a prototype for a BM tooling based on identified design principles.
In this research in progress (RiP) paper we present the outline of our experimental design for evaluating the developed prototype. In an experimental setting, we will evaluate what features of BM tooling can contribute to the BM exploration. In this RiP some preliminary results regarding the hypothesis are presented.
We aim to contribute to the literature by investigating what functions of the developed prototype contribute to the BM exploration. This research will allow us to provide design guidelines for the development of BM exploration artefacts.
The RiP is structured as follows. Section 2 provides a background on BMs. Section 3 shortly describes the prototype. Section 4 discusses the research approach. Section 5 presents the experimental design, while section 6 presents preliminary results. In section 7 we conclude.

2. Background

BMs can be seen as '[…] *a conceptual tool containing a set of objects, concepts and their relationships with the objective to express* […] *what value is provided to customers, how this is done and with which financial consequences*' (Osterwalder Pigneur and Tucci 22 p. 3). Magretta, points out that '*a good BM remains essential to every successful organization* [...] (2002, p. 3). However, BMs need to get revised over time in response to internal or external drivers (De Reuver, Bouwman and Maclnnes, 2009).
Digital technologies are a major external driver as they disrupt the business environment. A technology is defined as disruptive when causes turmoil in an existing market or creates a new market, requires major or minor revisions on the business model, leads to performance problems, and/or eventually leads to the need for new offerings (Bower and Christensen, 1995).
The existing studies on BM are mainly focused on the business design and (e.g. Osterwalder and Pigneur, 2010), evaluation (e.g. Ballon 2007; Bouwman, Haaker and De Vos, 2008). De

Reuver, Bouwman and Haaker went a step forward and focused on how an enterprise can move from an old to a new BM (2013). In practice, tooling is available in different formats and for different purposes (e.g. Osterwalder and Pigneur, 2010; Foresight cards, 2012; Leanstack, 2017; SWOT app; Haaker, 2017). However, BM for systematic BM exploration tooling is lacking, especially in relation to disruptive technology innovations. As Sosna et al. argue most BMs have not '*gone straight from the drawing board into the implementation* […] *in reality new BMs rarely work the first time around, since decision makers face difficulties in both exploratory and implementation stage*s' (2010, p. 384). In previous stages of our research we designed and developed a software-based BM tooling that aims to support enterprises during the business mode exploration process. Section 3 shortly presents the prototype we previously developed.

3. Description of the prototype

We created a working prototype of a software-based tool (using Microsoft Exel) based on specific design principles (Athanasopoulou, Haaker and De Reuver, 2018a, *forthcomming*), and a step by step approach to allow us to test each of the hypotheses independently: (1) description of components of the existing BM; (2) identification of new opportunities and potential changes towards a revised BM, and (3) the assessment, based on specific critical factors (Bouwman et al., 2008) of the changes defined in the previous step, see figure 1 for a screanshot of the first step.

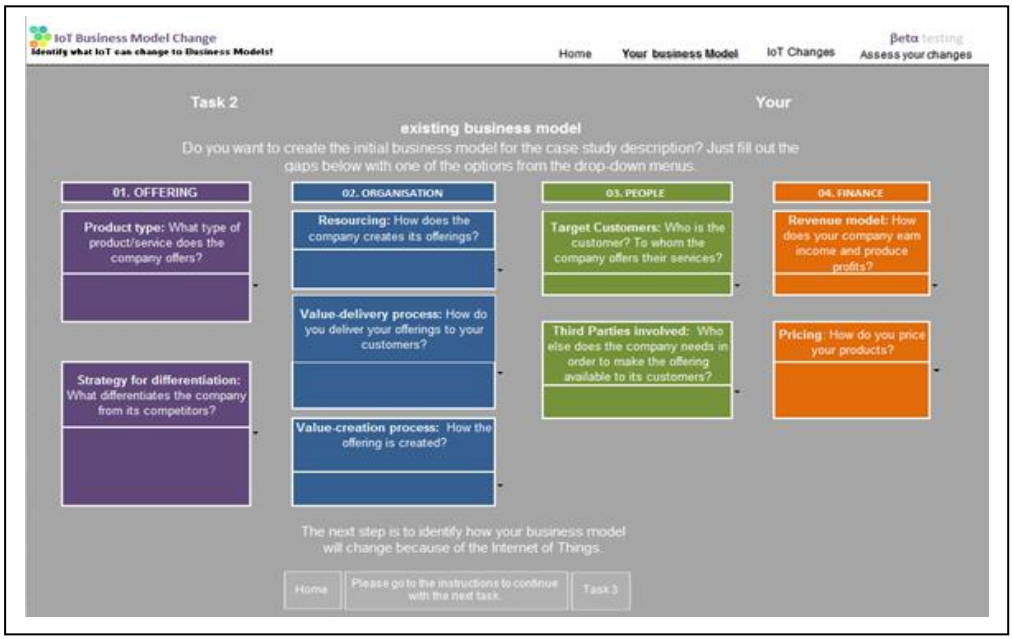

Figure 1: Screenshot of the first step of the developed prototype

4. Research Model

The main interest of our research is to evaluate what features a BM tooling can have to support entrepreneurs to facilitate BM exploration process. While a BM tooling can be designed based on various features for different purposes we focus on the three main design principles we identified on a previous phase of our research (Athanasopoulou et al., *forthcomming*), and the prototype is based on. In this RiP we present the research model (figure 2), and the hypotheses for the evaluation of the prototype. The developed hypotheses are derived from the design principles we identified previously, and informed the three steps of the prototype (section 3). The three design principles serve as hypotheses that we will test in an experimental setting.

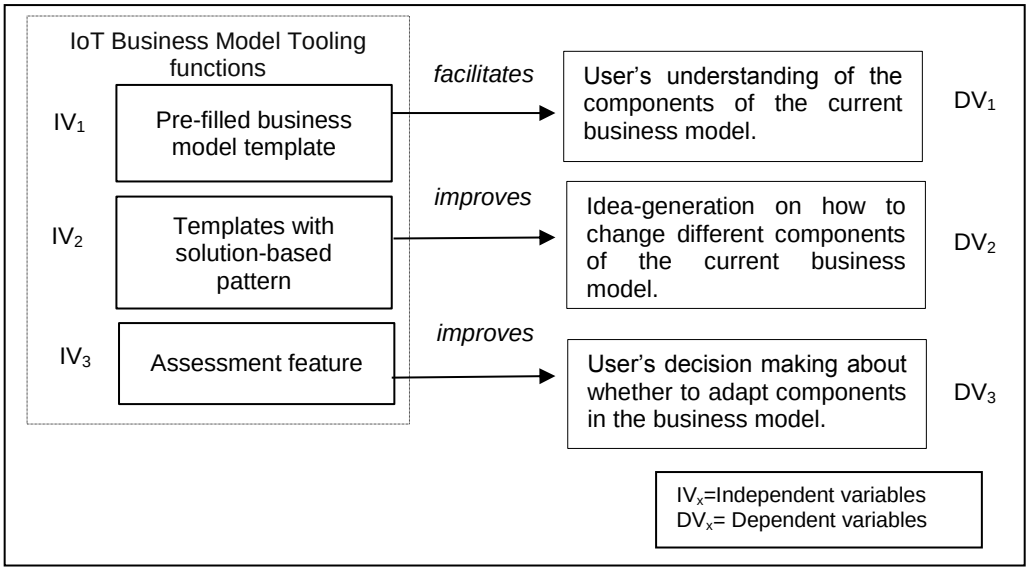

Figure 2: Research model

Therefore, we formulate the following hypotheses:

H₁: Pre-filled BM templates, facilitate the users' understanding of the components of the current BM.

H₂: Templates with solution-based patterns, improve idea-generation on how to change different components of the current BM.

H₃: Assessment features, improve users' decision making about whether to adapt components in the BM.

5. Methodology

To analyse our hypothesis we plan to conduct an experiment. Our experimental design can be described as a typical pre- and post-testing experiment with treatment and control condition (Cook and Cambell, 1979). For that experiment we will use two conditions: (a) a treatment condition, that is prototype designed for this study, (b) a control condition where subjects use an online version of the widely known and used framework BM Canvas created by Osterwalder and Pigneur (2010). Randomly assigned to one of the two conditions, the experiment will start with the subjects filling out a pre-test questionnaire. Then they will follow specific scenario-based tasks with the use of the BM tool. The experiment will end with the participants feeling out the post-test questionnaire, see Figure 3.

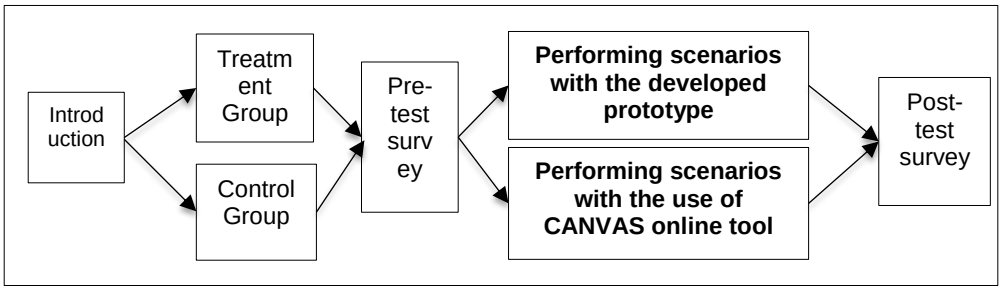

Figure 3: Experimental design overview

5.1 Procedure during the experiment

The subjects will be invited to a computer lab, and randomly assigned in one of the two conditions. The subjects form groups of three, so the experiment represents more accurate the business environment. The newly formed groups are asked to collaborate and discuss the available scenario in the computer in front of them (see figure 4 for an explanation). An external facilitator will be present at the class through the process and observe that the participants are continuing with the workshop and the scenarios. The subjects will have specific time (120 minutes) to complete the scenarios and fill out the questionnaires. While that is not totally realistic, it will allow us to collect completed questioners from all the subjects.

5.2 Subjects

The subjects will be master level students with an entrepreneurship interest who are partially experienced with the concepts of BMs, and service design. We aim to subjects that are both experienced, and inexperienced with a working environment, creating their own business, or not. That allows us testing the artefact with different potential users. To increase validity we aim to include practitioners (i.e. entrepreneurs) as subjects to the experiments.

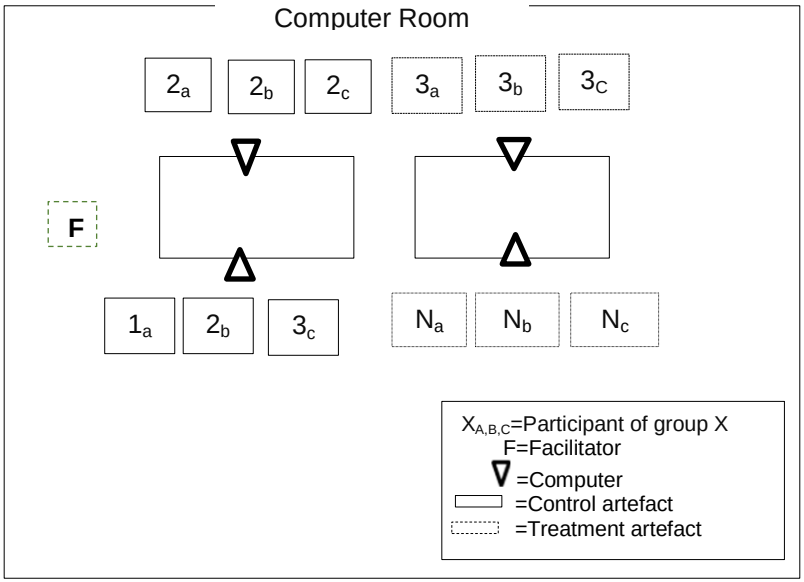

Figure 4: Experiment room layout

5.3 Questionnaire

Following the approach by Cook and Cambell (1979), the participants are asked to, individually, fill out a pre- and a post-test questionnaire. The subjects will fill out the questionnaires on hardcopies. Pre- and post-tests are used as measurements instruments just before and just after the use of the tool. Additionally, the pre-test includes some demographics (that will help us to decide if the data are appropriate for analysis), while post-test includes questions for evaluation of the session (for validity reasons). The pre- and post-questionnaires include questions (based on the hypotheses) regarding *the understanding of BM components* (e.g. BM tooling helped me to improve my understanding regarding BMs; I am aware of what I do not understand regarding BMs components), *idea-generation and BMs* (e.g. I am able to generate a sufficient number of ideas on how I can change an existing BM; I am able to generate qualitative ideas on how BMs components can be changed), and *decision making and BMs* (e.g. BM tooling helped me to make decisions regarding what I should change; When it comes to a decision regarding a BM change I prefer to do nothing).

5.4 Scenario

To ensure that the participants utilise the prototype apropriatly, we created a scenario with specific tasks that the subjects have to follow. In the scenario we created we will ask the subjects to work in groups to illustrate a realy life setting where they are managers of a car leasing company. The subjects follow the tasks to create the existing the BM of the case leasing company (based on given description), to brainstorm how ths BM can change in the case of a technology disruption (i.e., Internet of Things), and to asses these chances.

6. Preliminary results

While this research is still in progress some initial results are available (Athanasopoulou, Haaker and De Reuver, 2018b, *forthcoming*). We did that by partially following the experimental design described above. For these workshops the participants only used the developed prototype and not the controlled condition. We collected data from three workshops from November 2017 to January 2018. The subjects of these workshops were Master level students with entrepreneurship interest. The setting of the experiment is artificial and controlled, as it does not represent absolute a business environment. Computer rooms were arranged within the university (see figure 5 for an example of the setting). These workshops had a two-fold purpose: (a) for us to evaluate our experimental design, and second to collect initial data regarding the effects of the tooling to the BM exploration. The participants were invited to participate to the experiment (with a voucher as a reward). The researchers welcome the participants and shortly explained the purpose of the workshop. A concern form was also available. For ethical reasons the researchers left the room and a facilitator stayed in the room. The room was reserved for 120 minutes. The participants followed the instructions for the scenario. We collected preliminary results regarding the experimental design and the effect of the developed tooling regarding BM tooling (Athanasopoulou. Haaker and De Reuver, 2018b, *forthcoming*). We should mention that not all the subjects (N=23) fully filled-out the questionnaires. However, the results were significant to give us some initial results partially confirming the hypotheses. We shortly present the initial results regarding the hypotheses.

In the workshops, we collected quantitative data to evaluate the impact of the prototype on BM exploration. We did so by asking the participants to fill out the same questionnaire before and after the use of the prototype. The questionnaires were divided in three sections, each containing statements related to one of the three design principles.Then, we ran paired t-tests to measure differences before and after using the prototype. Out of the 17 pairs of statements (e.g. same question in the pre- and post- questionaire), five were significantly ($p<.05$), see Table 1.

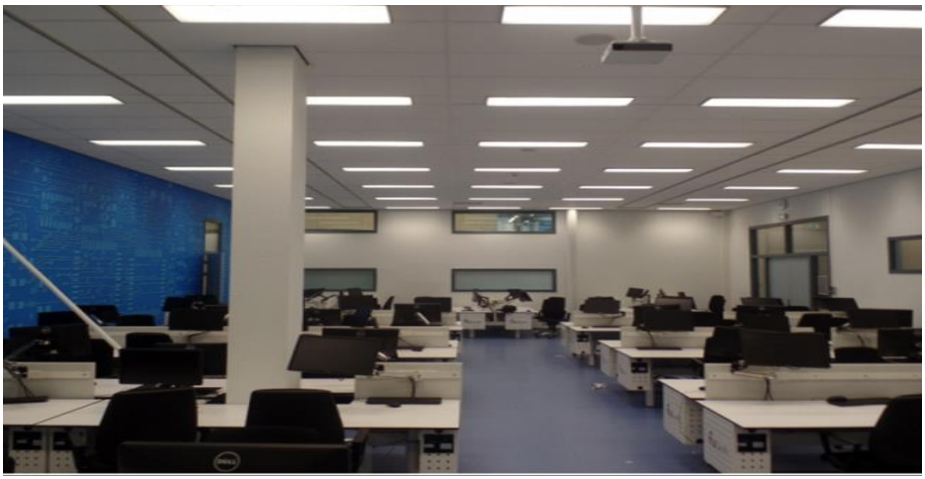

Figure 5: Experimental setting (http://educationrooms.tudelft.nl/zaleninfo.php?zid=31)

From these results we are not able to confirm or reject the hypotheses (something that we plan to do in the future), but we can see that the prototype, at least parcialy, contributes to the BM exploration. More specific, two pair related to the first Hypothesis, show that partcipants after the use of the tool had a better understanding of the BM componets and were able to apply their acquired knowlwdge to different settings. Regarding hypothesis 2, the use of the tool supported the idean generation and participants are able to do estimations about unexpecxted ideas. Finaly, regarding the third hypothesis, we were not able to confirme it, but the results showed that after the use of the tool the participants shown more eager to make decitions than staying neutral.

Hypotheses	**Statements**	**Mean Difference (M_{post}-M_{pri})**	**Standard deviation of Mean Difference (SD_{post}-SD_{pri})**	**T- test**
***H_1*:** Pre-filled BM templates, facilitates the users' understanding of the components of the current BM.	**$Pair_2$**: I have a solid interpretation of what the BM components are.	$Pair_2(M_{post}$-$M_{pri})$=1.00	$Pair_2(SD_{post}$-$SD_{pri})$=-1.70	t(16)=2.43, p<.05
	$Pair_3$: I am able to apply my knowledge on BM on a new context/case/industry.	$Pair_3(M_{post}$-$M_{pri})$=0.65	$Pair_3(SD_{post}$-$SD_{pri})$=1.17	t(16)=-2.281, p<.05
***H_2*:** Templates with solution-based patterns, improves idea-generation on how to change	**$Pair_{10}$**: I am able to generate qualitative ideas on how BMs components can	$Pair_{10}(M_{post}$-$M_{pri})$=.69	$Pair_{10}(SD_{post}$-$SD_{pri})$=1,30	(t15)=2,11 p<.05

different components of the current BM.	be changed.			
	Pair$_{11}$: I am able to estimate how inexperienced my generated ideas are.	Pair$_{11}$(M_{post}-M_{pri})=1.00	Pair$_{11}$(SD_{post}-SD_{pri})=-1,63	(t15)=-2.45, p<.05
H$_3$**:** Assessment features, improves users' decision making about whether to adapt components in the BM.	**Pair$_{16}$**: When it comes to a decision regarding a BM change I prefer to keep everything as it is.	Pair$_{16}$(M_{post}-M_{pri})=-.62	Pair$_{16}$(SD_{post}-SD_{pri})=.96	(t15)=2.61, p<.05

Table 1: Initial results (N=23).

7. Conclusion, Next Steps and Expected Contributions

In this RiP paper we present an experimental design for the evaluation of a new BM tooling. We presented the experimental design and preliminary data. The hypotheses are relatively confirmed (five statements out 17 were significand different).

A main limitation of these results is the number of the participants. In the near future we plan to repeat the experiments. Another issue is that the subjects might not be familiar with the BM concept and how a business operates. We could overcome this limitation by including at the experiments entrepreneurs. However, our results can present that our developed prototype has a positive effect on the subjects experience with the BM exploration. This RiP contributes to the field by providing initial insights on what type of functionalities of a BM contribute to the BM exploration process.

The next steps of our research are to improve the prototype, repeat the experiments, and to make final conclusions. Once our research is completed we aim to contribute to the BM innovation theory by focusing on the BM exploration phase and investigating the effect of BM tooling in this phase. We will contribute to the practice with the development of a theory based, and easy to use BM tool for the BM exploration.

Acknowledgments

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