Exploring Design Principles and Design Features for a Business Game to Teach the Relationship Between Business Models and Business Processes

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Abstract

Both business models and business processes represent crucial concepts for research and practice. Since both topics affect each other directly, understanding their connection is essential. However, literature does not provide a teaching concept focusing on their relationship. Using a business game could provide a suitable solution for that purpose due to its features. Therefore, the goal of this paper is to design and evaluate a business game that can be used to teach the relationship between business models and business processes. Towards this end, we apply a design science research approach to build the business game. Based on our identified design requirements, we introduce a set of design principles guiding our design process. Moreover, we demonstrate a prototypical instantiation using design features and evaluate our results with focus groups. Our work contributes to the design knowledge base of business games in the context of business models and business processes.

1 Introduction

Both business models (BMs) and business processes (BPs) are important terms for research and practice [1-4]. While BMs are used for securing and improving the competitive advantage of a company [4], the management of BPs can help to increase productivity and save costs [3]. The innovation of a given BM, as well as changes in existing BPs, are established approaches to remain successful while competitive conditions intensify [4, 5]. Moreover, both concepts are interrelated since a BM can be seen as the starting point from which the concrete BPs are derived [6]. This means the innovation of a BM will lead to changes in the corresponding BPs [7]. The reverse, i.e., changing BPs affecting the BM, is also described in the literature [8, 9].

Given this close link between the two topics, it is reasonable to consider them together [6]. This is especially important in information systems (IS) education, as BMs and BPs represent central topics [10]. However, as the literature shows, the concepts are usually taught separately to the students: There are various examples of teaching concepts that focus either on BMs [e.g., 11, 12] or on BPs [e.g., 13, 14]. Yet, as part of our initial literature reviews, we identified that no study focused on teaching the relationship between both topics [15]. For instance, one of the few papers we found that addresses both BMs and BPs is the work of Bolton, et al. [16]. They describe a simulation tool for educational purposes focusing on the concept of digital disruption. According to their paper, this affects both the BM and BPs [16]. However, their tool is geared towards marketing and does not emphasize the link between BMs and BPs. Thus, we argue that research on teaching the relationship between both important concepts is still lacking.

To address this challenge, we propose a design science research (DSR) project following the guidelines of Kuechler and Vaishnavi [17]. We aim to construct a business game (BG) since it constitutes a promising approach to teach the relationship between BMs and BPs due to its features [18]. For instance, BGs in the context of BPs such as *ERPsim* showed that the students benefit from them by improving their learning success [19, 20]. Besides, one of our initial literature reviews showed that learning by doing represents an important and effective teaching method for conveying BMs and BPs to students [15]. Since BGs are predestined for realizing such an approach, IS students could use our BG to deepen their understanding of how BMs and BPs work and affect each other. Therefore, we raise the following research question: *Which design principles and design features should a business game follow to teach the relationship between business models and business processes to information systems students?*

We begin by deriving design requirements (DRs) [21] based on our previous research and formulating

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design principles (DPs) [22, 23]. These DPs guide the conceptualization of the BG. Then, we construct an initial prototype using concrete design features (DFs) [21]. Finally, we conduct exploratory focus groups to evaluate our DPs and DFs [24]. Our findings provide several theoretical and practical contributions and inform the second cycle of our DSR project.

The remainder of this paper is structured as follows: First, we present an overview of the theoretical background in the second chapter. Then, we describe the research approach and our DSR project including the previous results in the third chapter. Next, we formulate DRs and DPs for our BG and describe the instantiation of the proposed design by depicting our DFs in the fourth chapter. Besides, we present the evaluation of our DPs and DFs using focus groups in this chapter. Then, we discuss our findings in terms of theoretical and practical implications in the fifth chapter. Finally, we provide a brief conclusion to the first iteration of our DSR project in the sixth chapter.

2 Theoretical Background

2.1 Business Models and Innovation

BMs have been a well-researched topic in the last two decades [1, 4]. They are mainly used as a tool for helping organizations to remain competitive in dynamic markets [25, 26]. Literature often describes a BM using the four components of value proposition, market segments, the structure of the value chain, and value capture mechanisms [27]. Moreover, linking these components also represents an important aspect of a BM [27, 28]. Besides, BMs are subject to change: Innovating their BM can help organizations to withstand intensifying competitive conditions [4]. A BM innovation depicts the process of transforming the given BM of an organization into a revised one to gain a competitive advantage [1, 4, 27].

Researchers and practitioners can use various frameworks to express and visualize a given BM [26, 29]. Two well-known frameworks are the *BM Canvas* (BMC) developed by Osterwalder and Pigneur [30] and the *Magic Triangle* created by Gassmann, et al. [31]. The BMC defines a BM using nine dimensions. These include, among others, value proposition, cost structure, and the revenue stream [30]. The *Magic Triangle*, on the other hand, can be seen as a leaner version since it only uses four dimensions to describe a given BM: target customer, value proposition, value chain, and the revenue model [31, 32].

2.2 Relationship Between Business Models and Business Processes

There has been a lot of research about the management of BPs over the last decades in computer science, management science, and IS [2, 3]. Organizations can use it as an instrument to arrange their activities [33] striving to increase productivity and reduce cost [3]. A BP generally refers to a set of events and activities in an organization producing a specific output that is consumed by a customer [34]. Typical examples include the procurement, production, and sales processes. Similar to BMs, BPs are subject to change [5]. Companies rethink their BP due to several reasons such as potential improvements and economic pressure [35].

BMs and BPs are related to each other [e.g., 6, 7, 32]. For instance, Al-Debei and Avison [6] see the BM as the base system from which the concrete BPs are derived. Innovating the BM will, thus, affect the BP level since both concepts are linked [7, 9]. For example, a company would need to implement a production process if one aspect of the intended BM is to manufacture products itself. However, the literature also shows that the relationship is bidirectional since changes in the BPs can lead to a revised BM [9, 32]. This implies that, for example, implementing and using a production process could lead to a BM that considers production as an important aspect.

2.3 Business Games in Information Systems Education

Games used for serious purposes have a long tradition in several disciplines [36]. While military and economics were the first domains to apply them, the usage of simulation games also shifted to education in business in the past decades [37]. Serious games, in general, focus on improving skills and teaching players educational content besides the sheer purpose of entertainment [38]. Thus, they are not part of gamification that emphasizes the usage of game elements in a non-game context [36]. BGs can be seen as a specific kind of educational games that focus on management-related topics [39]. The aim of using a BG is to offer the students an opportunity of learning by doing in an authentic management situation depicting a real-world experience [40]. The students learn due to intrinsic motivation that includes various learning and motivation theories such as flow theory [41].

BGs cover a variety of different topics in IS education, such as BP management [e.g., 13, 19] and supply chain management [e.g., 42]. For example, Léger [19]

presents a BG that centers on the execution of BPs based on a real enterprise resource planning (ERP) system. It shows that the students benefit from using the BG by increasing their learning success [19, 20]. Therefore, we argue that a BG focusing on the relationship between BMs and BPs could also achieve similar results when used with IS students.

3 Design Science Research Project

3.1 Design Science Research Approach

DSR represents an essential and established paradigm in IS research [43-46]. It refers to the construction of socio-technical artifacts for solving organizational problems and deriving prescriptive design knowledge [43, 47, 48]. Various approaches exist to conduct DSR [e.g., 17, 49, 50]. Since the goal of our research is to design and develop a BG to teach the relationship between BMs and BPs to IS students, we decided to carry out a DSR project. Although several BGs for IS education exist, very few claim to use a DSR approach [e.g., 13]. Therefore, we argue design knowledge is sparse and using the DSR approach can additionally provide valuable insights for building BGs. For the BG's construction, we follow the widely used DSR approach suggested by Kuechler and Vaishnavi [17]. They propose a methodology consisting of five phases and potential iterations for building an artifact. We applied it to our DSR project, as illustrated in Figure 1. We also draw on the three-stage approach (i.e., DRs, DPs, and DFs) of Meth, et al. [21] to conceptualize our BG.

Process Steps	First Design Cycle	Second Design Cycle
Awareness of Problem	Identification of problem through literature reviews	
Suggestion	Formulation of DRs and DPs	Refinement of DRs and DPs based on analysis results
Development	Development of prototypical BG using DFs	Development of revised BG using refined DFs
Evaluation	Exploratory focus groups with lecturers and IS students	Experimental evaluation with IS students and confirmatory focus groups with lecturers and IS students
Conclusion	Focus group analysis	Evaluation analysis and nascent design theory

Figure 1: Design cycles based on Kuechler and Vaishnavi [17]

Based on the above-mentioned methodology, we structured our DSR project into two design cycles. The research presented in this paper focuses on the first cycle, specifically the suggestion, development, evaluation, and conclusion phases. We started the first design cycle by performing two detailed literature reviews to identify the problem [15, 32] following the guidelines of Webster and Watson [51] and vom Brocke, et al. [52]. While the first literature review examined the current state of the art of the relationship between BMs and BPs, the second one analyzed applied teaching concepts in the context of BMs and BPs. The second one also covered the identification of the learning objectives (LOs) that informed the initial set of the DRs [15]. Their identification helped us to specify the scope and boundaries of our BG [47]. DRs are functionally similar to the meta-requirements presented by Walls, et al. [53], but fit better with our general research design [21]. Based on the DRs, we formulated high-level DPs in the suggestion phase [22, 23]. We then instantiated the DPs by translating them into concrete DFs to develop an initial prototype of our BG [21]. Next, we evaluated the derived DPs and DFs by conducting exploratory focus groups according to Tremblay, et al. [24]. This evaluation approach was already successfully applied in other DSR studies [e.g., 54, 55]. In general, we follow the evaluation framework proposed by Venable, et al. [56] for our DSR project. Since the BG represents a user-centered artifact, we apply their *Human Risk and Effectiveness* strategy to evaluate its utility and benefit in a real-world context [56].

Subsequent to the first DSR cycle described in this paper, we intend to conduct a second cycle. There, we will refine the DRs, DPs, and DFs based on the evaluation results of the first cycle. Besides, we use them to revise the artifact. To evaluate the conceptualization and the instantiation of the BG, we intend to run confirmatory focus groups [24] and an experimental evaluation with IS students [57]. The main outcome of the entire DSR project will consist of (1) an evaluated instantiation of a BG to teach the relationship between BMs and BPs and (2) derived design knowledge in the form of a nascent design theory [43, 58].

3.2 Previous Results of our DSR Project: Problem Awareness

We started the problem awareness phase by conducting two literature reviews to identify the research gap of our DSR project [15, 32]. The first literature review was conducted to examine the current state of the art of the relationship between BMs and BPs. Our results showed, among other things, that BMs and BPs can affect each other [32]. The focus of the second literature review was on analyzing applied teaching concepts in the context of BMs and BPs. Based on the findings of our literature review, we identified the teaching concepts as described above

[15]. LOs were then extracted from the concepts and categorized based on the revision of *Bloom's Taxonomy* [59]. This taxonomy "[...] is a framework for classifying statements of what we expect or intend students to learn as a result of instruction." [59].

3.3 Preparation of Focus Groups

For preparing and conducting the focus groups, we followed the eight-step procedure of Tremblay, et al. [24]. First, we decided to conduct exploratory focus groups since we wanted to gather feedback for refining the artifact's DPs and DFs at the current stage of the DSR project. Second, we choose to run one pilot focus group with four participants and three exploratory focus groups with five participants each. The goal of the pilot focus group was to test the questioning route. Each participant of the exploratory focus groups has a background in IS, knowledge about BMs and BPs, experience in BGs, and represents one of the four roles of our target group. These roles are BG designers, lecturers that want to convey their content with BGs, teaching assistants that help students to use BGs, and IS students that we target as players. Third, we chose one artifact designer as the focus group moderator and appointed an observer that looked after the moderator's neutrality and the timekeeping. Fourth, we developed a questioning route consisting of 14 questions, seven for evaluating the connections from DRs to DPs and seven for evaluating the connections from DPs to DFs. Fifth, we recruited participants we knew through university and research via email. Sixth, we conducted the focus groups online due to the *COVID-19* situation in Germany in November 2020. After a short introduction of the artifact's context, we went through the questioning route. Besides, we conducted a brief SWOT analysis at the end of the focus groups to receive further general feedback. Each of the three exploratory focus groups lasted on average just over 90 minutes and were held in German. Seventh, we analyzed the gathered data with the proposed method of Corbin and Strauss [60]. Here, we categorized key issues of the current BG's design. Eighth, we present the results of the focus groups in the following section.

4 Designing the Business Game

4.1 Suggestion: Formulating Design Requirements and Design Principles

We started the suggestion phase by translating the previously identified LOs into DRs following Meth, et al. [21]. In total, we formulated a set of 12 DRs based on the LOs from the literature for teaching the relationship between BMs and BPs. These 12 DRs represent a starting point for conceptualizing the BG and will be further revised during the DSR project. Table 1 lists the DRs in addition to exemplary sources from the literature review and the corresponding DPs and DFs.

Based on the identified DRs, we formulated an initial set of seven DPs, according to the guidelines of Chandra, et al. [22]. They define DPs as prescriptive statements that include what and how to construct an artifact to achieve a certain design goal [22]. We jointly derived the DPs from the DRs in an argumentative way. Table 1 depicts an overview of the relationship between the DRs, DPs, and DFs. A more recent approach in creating DPs is proposed by Gregor, et al. [23]. Since this journal article was published after our DPs were formulated and evaluated, we could not proceed as described. Still, each of our formulated DPs already involves the mechanism, users, and target as required by Gregor, et al. [23]. Missing components in the description of the DPs are implementors, context, and rationale. For all DPs, BG designers are the implementors and the BG context does not differ between the DPs. The rationale of each DP can be derived from the DRs on which it is based.

We began by formulating the first DP (**DP1**): *provide the definitions of the important terms of BM, BP, and their general relationship so that students have a basic understanding from the beginning*. This should help the students to get familiar with both key terms and have a brief overview of how they relate to each other. It also creates a solid foundation for students to deepen their knowledge of the relationship between BMs and BPs and thus implementing DR1 and DR2. Next, we derived from DR3 and DR4 the second DP (**DP2**): *provide tools and their explanations so that students understand how they can be used for describing BMs and BPs*. There are various ways to represent both concepts. For BMs, the best-known options are the *Magic Triangle* and the BMC. For the graphical representation of BPs, you could use, for example, *BP Model and Notation* (BPMN) [61]. Regardless of the specific tools, students can use them to enhance their understanding of the elements and structure of a BM and BPs. Then, we formulated the third DP (**DP3**): *provide examples of typical BM innovations so students can understand and apply them to a specific BM*. Using a concrete example of a BM innovation should help to increase the students' comprehension of how a BM transforms from one stage to another as stated in DR5 and DR6. For instance, the transition from a producer to a service

Table 1. Set of DRs and corresponding DPs and DFs

#	Design Requirement	Exemplary Source	Design Principle	Design Features
DR1	*Provide the definition of a BM.*	Fichman, et al. [62]	DP1	DF2, DF16
DR2	*Provide the definition of a BP.*	Bandara, et al. [63]		
DR3	*Provide tools to describe BMs.*	Darnell and Rahn [64]	DP2	DF2, DF10, DF13, DF16
DR4	*Provide tools to describe BPs.*	Lainema [65]		
DR5	*Provide typical examples of BM innovation.*	Spaniol, et al. [66]	DP3	DF1, DF5, DF6, DF8
DR6	*Enable the application of BM innovation examples.*	Gupta [67]		
DR7	*Enable the analysis of BM innovations.*	de Reuver, et al. [68]	DP4	DF1, DF9, DF11, DF12
DR8	*Enable the analysis of BP changes.*	Bandara, et al. [63]		
DR9	*Enable the analysis of **what** BPs change during a BM innovation.*	Löffler, et al. [69]	DP5	DF1, DF4, DF7, DF14, DF15
DR10	*Enable the analysis of **how** BPs change during a BM innovation.*	Cavalcante, et al. [70]		
DR11	*Enable an evaluation and discussion of learning outcomes for the learners.*	Monk and Lycett [14]	DP6	DF3
DR12	*Enable the creation of a strategy to innovate a BM.*	Hoveskog, et al. [71]	DP7	DF3, DF7, DF15

provider could be taught as a specific example. Afterward, we combined the BM perspective from DR7 and the BP perspective from DR8 to form the fourth DP (**DP4**): *provide the opportunity to look at BM and BP changes separately so that students can focus on analyzing their individual steps*. Thus, the students should be enabled to look at the two separate processes of BM innovation and BP change in detail. Understanding how they work separately is a mandatory step before understanding how they affect each other. Next, based on DR9 and DR10, we formulated the fifth DP (**DP5**): *illustrate the changes in the BM and BPs and how they affect each other so that students can analyze their relationship*. This can be achieved by visualizing the changes of both and the subsequent impact on the other. Thus, students can learn what and how BPs change when transforming a BM and vice versa. Then, we derived the sixth DP (**DP6**): *initiate a discussion so that students can share their experiences, problems, and solutions of the course*. Based on studies already presented in context of DR11 [e.g., 14] and also our own practical experience, a discussion at the end is crucial for the learning success of students since it helps to consolidate their knowledge. Finally, we addressed DR12 with the seventh DP (**DP7**): *encourage students to reflect on their own experience with BM innovation so that they can use it to develop a new or revised strategy for innovating one*. Based on their reflection, students should develop a new or revised strategy for conducting the previous tasks again. This seems useful for two reasons: First, students can see in retrospect both their right decisions and their mistakes, and second, they can use their knowledge for a possible second round to innovate a BM and change BPs.

4.2 Development: Instantiation of Proposed Design Using Design Features

Based on the formulated DPs, we started to construct a BG as part of our first DSR cycle. We developed it by using concrete DFs that helped us to instantiate the identified DPs as indicated in Table 1. Meth, et al. [21] define DFs as the link between the DPs and the actual artifact. Since DPs are abstractly formulated, DFs can be used to complete this final step of conceptualization [21] We derived the DFs argumentatively from the DPs. For illustration purposes, we highlighted some of the DFs on screenshots from the BG in Figure 2.

Our first DF is to use the interactive environment of a BG [20] to convey the relationship between BMs and BPs (**DF1**). Since we argue that this relationship can be observed best while changing both BM and BPs, a high degree of interactivity is necessary, thus supporting DP3, DP4, and DP5. Moreover, we decided to complement the BG with an introductory slide deck to familiarize the students with the key terms, the setting, and the gameplay (**DF2**). Providing the necessary information for playing the BG enables DP1 and DP2. After finishing the BG, we conduct a discussion with all participants to share their experiences and problems (**DF3**). It allows them to reflect on their behavior and therefore addressing DP6. From the technical point of view, we decided to develop the frontend and backend of the BG on an *SAP S/4HANA* system by using *UI5*, *OData*, and *ABAP* (**DF4**). It helps to enable DP5 by illustrating the process perspective due to two reasons: First, an ERP system offers a realistic representation of an enterprise

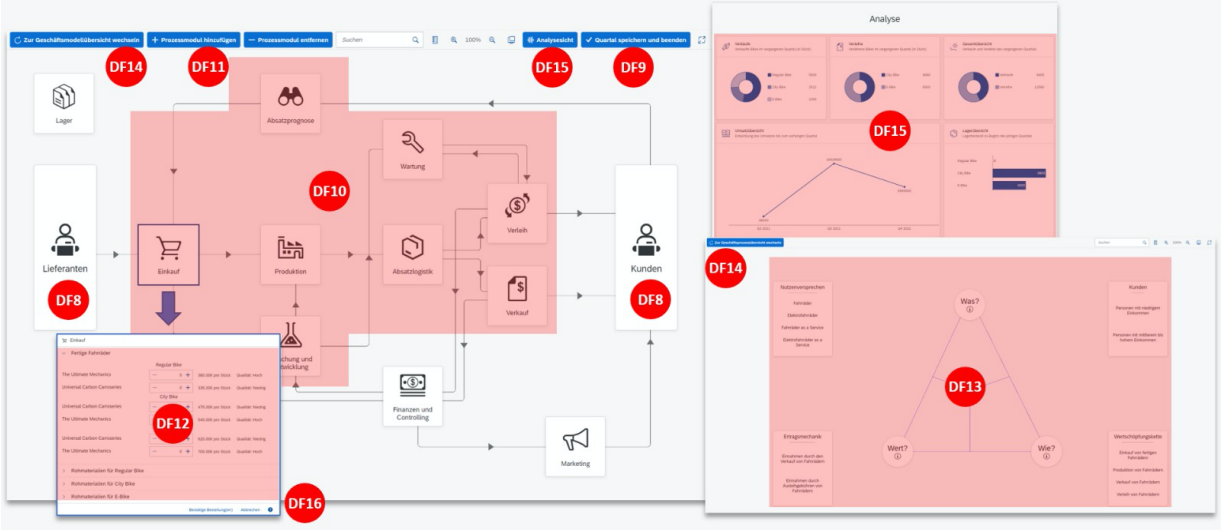

Figure 2: Main interfaces of the BG showing exemplary DFs

system dealing with BPs [69]. Second, it will be useful for future enhancements if we want to link the BG directly with the internal processes of an ERP system.

As for the story and setting of our BG, the students take on the role of a C-level executive who has to lead a bike company to success (**DF5**). We thus address DP3, since we argue that the servitization of a bike manufacturer is an easy-to-understand example. Additionally, we opted for a sandbox approach by allowing them to manage their company with various strategies and measures (**DF6**). For instance, the students are free to switch their BM to a distributor, a producer, or a service provider. Thus, addressing DP3 by enabling the transitions between these typical BM examples. This freedom to operate will increase the students' identification and understanding of their decisions [41]. Moreover, the BG requires advanced planning by the students (**DF7**). This means some decisions are only beneficial after a certain amount of game time, thus targeting DP5 and DP7. For example, they can launch specific research and development projects in the BG, which can take several rounds to complete. One of these projects concerns the construction plan of an e-bike. Therefore, the students have to wait until the project is completed before producing e-bikes. Consequently, they must plan a few rounds into the future to coordinate their decisions. To support DP3, specific parts of the BG are completely automated (**DF8**). We argue this decision helps to increase the students' immersion and improve the flow of the game. For instance, the suppliers and the customers that interact with the students' company are automated. This means that when the students order raw materials or finished products, they receive them from a selected supplier in the game. The same logic applies to the selling of bikes to the customers. If the bikes in demand are available at a reasonable price, customers will buy them. Besides, we decided to structure one game run into several round (**DF9**). Each round represents one quarter in which the students can make their decisions. After making all the decisions, the students must end the round themselves to progress to the next one. This helps them to take enough time to make their decisions and thus enabling DP4.

The first main interface displays the BPs and implements DP2 by presenting them as aggregated high-level modules (**DF10**). This representation does not follow an established modeling language such as BPMN. However, this simplified view of the BPs enables the students to understand their current situation more easily, ensures clarity, and lets the students focus on the bigger picture. The students can modify the process flow created by the connections of these BP modules by inserting and removing them (**DF11**). This allows the students to change their BPs step by step and arrange them in a new way to represent the desired BM. Besides, it increases the number of BM innovation options for the students and therefore covers more possible BMs in the leading example, thus addressing DP4. Another feature that allows changing the BPs gradually, as indicated in DP4, is the opportunity to make certain decisions in most of the process modules (**DF12**). For instance, the students have to estimate the sales target for the next round in the process module *Forecast*. This increases their immersion as they have to make proactive decisions at the BP level and leads to a deeper understanding of the BPs. The second main interface displays the *Magic Triangle* by Gassmann, et al. [31] (**DF13**). Thus, providing a tool for describing BMs as indicated in DP2. It is more streamlined than other BM representations like the BMC while offering a

sufficient degree of detail. Therefore, the students can comprehend the changes in the BM more easily without the need to learn a complex model beforehand. Both main interfaces are connected so the students can see the impact of BP changes on the BM. For enabling DP5, we integrated a button that allows switching to the other main interface to inspect the changes there (**DF14**). This allows the students to quickly identify the current state of both views and simplifies the process of drawing conclusions between them. As a third main interface, we have integrated an analytical view into our BG (**DF15**). It supports DP5 by allowing the evaluation of the performed BM and BP changes at the end of each round and also at the end of the game. Besides, it helps the students to revise their current strategy on this basis, thus addressing DP7. Finally, we provide the students tips in the form of help buttons (**DF16**). These provide necessary information for playing the BG and thus supporting DP1. For example, students can see what each dimension in the *Magic Triangle* means.

4.3 Evaluation: Exploratory Focus Groups

In the analysis of the focus group data, we have identified three key issues concerning the current BG design. These key issues will most likely have a negative impact of the students' learning success of the relationship between BMs and BPs. Despite that, we received positive feedback for most of the DPs and DFs. For instance, DF1, which emphasizes the interactivity of the BG, was particularly well received.

The first uncovered key issue is that the BG's complexity is currently too high concerning the provided aids. Therefore, students may not be aware of the necessary decisions they need to make and may have difficulty developing strategies because they do not know the scope of decision-making. Furthermore, the participants emphasized that the students need "to have a certain understanding whether this is a good decision or not". Otherwise, the students could get demotivated fast after facing the consequences of bad decisions. To counter this issue, participants proposed several suggestions. The most mentioned were a short demo round to get used to the system, additional guidance like a cheat sheet, and narrowing the possible options down.

The second key issue is that students are not encouraged enough to reflect or reason their decisions. The focus group participants criticized that the planned discussion (DP6 and DF3) is not sufficient for the students to reflect and to consolidate their knowledge about the relationship between BMs and BPs. However, since the participants liked the general idea of a discussion, they proposed a discussion on an exemplary game. Other important suggestions by the participants were written round reports, presentations, and an accompanying worksheet that the students can "fill with their own experiences".

The third key issue is related to how the connection between BMs and BPs is presented in the BG. Here, the participants want to "go a little bit more into the relationship between [BMs and BPs]". For example, they proposed a visual signal whenever the BM changes based on the actions in the BPs interface.

Combining the three key issues, we conclude the following main message: To improve the students' learning success for the relationship between BMs and BPs, the depicted complexity of the topic in the BG must be reduced. It can be achieved by providing adequate feedback and ensuring that the relationship between BMs and BPs is understood and reflected upon.

5 Discussion

5.1 Implications on the Business Game's Conceptualization

Based on the gathered feedback, we plan to adapt the conceptualization of the BG to improve the students' learning success of the relationship between BMs and BPs. Regarding the first key issue, we suggest adding two new DRs: The BG should address the complexity of the topic (**DR13**) and the BG should provide continuous feedback and support (**DR14**). We also suggest combining both new DRs to one additional DP: *provide continuous feedback and support to the students so they can master the complexity of the topic* (**DP8**). This is in line with the work of Hamari, et al. [72], who state that if the difficulty of a game is too high, the flow of the game and thus the learning success decreases. Results from the focus groups suggest that the difficulty level of the game should be lowered to a more appropriate level by adding feedback. Further, we propose five new DFs for the first issue: First, we suggest warning students about aspects they may have forgotten before completing their turn (**DF20**). Second, we propose to exclude strategic decisions that do not make sense in a specific situation (**DF21**). Third, we suggest providing a cheat sheet indicating major strategies and key information of the BG (**DF22**). Fourth, we propose to integrate a save game management system to allow students to start more than one game instance by themselves (**DF24**).

For the second key issue, we see DR11 as sufficient but suggest reformulating DP6 to facilitate a discussion so that the students can exchange their experiences, problems, and solutions for this course.

Also, we propose new DFs for the second key issue: First, we suggest implementing a function addressing students' performance through calculated scores (**DF18**). We argue that these will provide a good foundation for the discussion. Second, we propose to give students guidance on how to improve their performance (**DF19**). Third, we suggest providing a worksheet that encourages the students to reason their decisions (**DF23**). This type of reflection does not interrupt the flow of the game, unlike, for example, presentations after each round. Interrupting the flow of the game can lead to a diminishing learning effect, as shown in the work of Cowley, et al. [73].

For the third key issue, we see DR9 and DR10 as sufficient, as well as DP5. To emphasize the relationship between BMs and BPs in the BG, we suggest a new DF that notifies the students when their BM has changed (**DF17**). This is also supported by the work of Grund and Schelkle [74], as they state that immediate feedback may improve learning performance.

5.2 Theoretical and Practical Contributions

Our work contributes to both theory and practice. We identified three theoretical implications. First, we intend to derive design knowledge in the form of a nascent design theory [43, 58]. We, therefore, propose a design theory for BGs teaching the relationship between BMs and BPs, following Gregor and Jones [47]. Although our design theory is at an early stage, applying their guidelines helps us to convey the advance in the field of prescriptive design knowledge that has been achieved [58]. Second, the design of the BG contributes to the existing body of knowledge since we derived and used DPs for guiding its construction [43]. These DPs are independent of specific implementations [22] and provide guidelines for teaching the relationship between BMs and BPs. Thus, concerning artifact mutability [47], our derived DPs could also be easily adapted to other forms of teaching concepts. Third, we formulated and evaluated DFs helping us to instantiate the DPs. As with the DPs, our DFs could be used and adapted for similar DSR projects addressing BGs in the context of BMs or BPs.

From a practical perspective, the evaluated BG could be used as an addition to the IS curriculum when teaching BMs and BPs. It may help students to improve their understanding of the relationship between the two concepts. Especially for beginner courses such as the introduction to IS, our BG seems like a valuable addition to the curriculum due to its content.

6 Conclusion

As with any research project, our study is subject to limitations. First, since the DSR project is at the end of the first cycle, we have so far only conducted a qualitative evaluation in the form of focus groups. Consequently, a quantitative evaluation (e.g., an experiment) is missing at the moment. However, such a type of evaluation could provide valuable insight into how well our artifact is working [57]. Second, for formulating the DPs and DFs, we used an argument-based approach. Since the authors derived the DPs and DFs based on their theoretical knowledge and practical experience in the problem domain, other researchers could set their focus differently.

This paper presents our ongoing DSR project on the design and development of a BG to teach the relationship between BMs and BPs to IS students. Towards this end, based on our identified DRs, we formulated DPs guiding the BG's construction. Next, we presented an initial prototype of the BG that we constructed by using concrete DFs based on the formulated DPs. Finally, we used focus groups for evaluating the design of the BG and discussed the implications on our sets of DRs, DPs, and DFs. Our results contribute to both theory and practice since we propose an evaluated design of a BG to teach the relationship between BMs and BPs. Besides, the results inform the next design cycle of our DSR project.

7 References

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