Digitalization of an Educational Business Model Game

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Abstract. Entrepreneurship Education is an important field of entrepreneurship research and has become a part of many programs of business and engineering schools. Research also confirms that a new generation of learners, the generation of millennials, has emerged that shows a preference for interactive and experiential learning. Contemporary entrepreneurship education follows this approach by including a set of practices where students can explore concepts through personal experience. Educational games are a powerful tool to create such a learning environment. With the goal of investigating digitalization of business games, which are typically played in large groups and face to face, we particularly focus on the use case of the business model game called “inspire! build your business”. We give an overview on relevant comparable games, report on our approach for digitalization focusing on our use case, and we address the following research questions: How can the currently implemented game mechanics be improved and what needs to be considered when implementing a fully digital version of the game? We adopt an engineering-based approach, where we build an application for being tested in a heuristic evaluation. The results of our analysis provide motivation to continue the digitalization of our business model game.

Keywords: Entrepreneurship education · Educational game · Digitalization · Gamification · Experiential learning

1 Introduction

According to a recommendation of the European Parliament and the Council, entrepreneurship is one of the key competences for lifelong learning [1]. This advice was a significant impulse for entrepreneurship education to gain importance in Europe, both as a field of research and in school practice. Meanwhile, entrepreneurship education has become an integral part of many programs of business and engineering schools [2]. Research confirms that a new generation of learners, the generation of millennials, has emerged that shows a preference for interactive and experiential learning. Contemporary entrepreneurship education follows this approach by including a set of practices where students can explore concepts through personal experience [3].
Educational games are a powerful tool to create such a learning environment [4]. They allow the communication of theories and methods in a playful way and encourage students to think and act entrepreneurially. Entrepreneurial games teach how to identify opportunities, evaluate risks, stimulate processes to find ideas for their implementation, and how to test alternative business models quickly. Finally, they are suitable for reflecting on the decisions made and actions taken in the game.

A further trend is the digitalization of teaching and learning. Digital technologies help teachers in various ways because they can reduce paperwork, facilitate the distribution of information, and foster students’ empowerment and new forms of interactions. The Corona crisis demonstrated the importance of these technologies for teaching in schools. The benefits of greater integration of digital elements in the classroom enable teachers to provide individualized support to students, which can improve the student-teacher relationship. Spatially and temporally distributed work is also favored. Further, other forms of information transfer, such as short films or quizzes, can be easily integrated into the class and support students in self-directed learning. The diffusion of these new forms of learning is favored because most students already have the necessary digital skills and the required hardware, such as tablets and smartphones.

Within this article, we discuss an innovative business game called “inspire! build your business” [5]. The business model game is designed for high school students as well as university students and encourages them to think and act entrepreneurially. It aims to increase their awareness, motivation, and skills for entrepreneurship. Initially, it was a physical board game. Triggers for the development of a hybrid game version were barriers in the school environment as well as the needs of potential users. Schools often do not have the necessary space, tools, and resources to use this learning game with distributed roles and activities. Digitized game elements make it easier to implement the distributed work of students required due to insufficient space. Digitization also enables more cost-effective updating of teaching materials, including new case studies. Fewer paper copies are also beneficial in terms of resource conservation. Teachers who used the game in their class expressed the wish that they would prefer to use the time they need to distribute and organize materials to coach the students during the game. The digital version also facilitates the further training of teachers, who have the role of coaches and instructors in the game. New game variations and innovative case studies or instruments can be offered more easily in the form of videos or webinars. In this way, they expect a higher efficiency and effectiveness of teaching.

In the paper, we report on the first stage of digitalization and discuss early reception based on a heuristic evaluation with experts assessing the approach. With the overall goal of investigating the (partial) digitalization of business games, which are typically played in large groups and face to face, we particularly focus on the game “inspire! build your business” and with a heuristic evaluation addressing the following research questions: How can the currently implemented game mechanics be improved? What needs to be considered when implementing a fully digital version of the game?
2 Games in Entrepreneurship Education

Prior research supports that games, simulations, and gamification techniques promote learning and that they are powerful tools to create a motivating learning context [6–9]. Business games and simulations have a long history in business education, dating back to the year 1956. Whereas early business games were hand scored and based on classroom activities, recent games use increasingly digital learning environments [10, 11]. Within our literature review, we are especially interested in games within the context of entrepreneurship education. Belotti et al. (2014) investigated serious games adapted in higher business and entrepreneurship education in Europe. The analysis of 11 serious games shows that most of them simulate small business management, but there are hardly any, which emphasize on innovative product and service development [12]. Fox and colleagues (2018) also reviewed eight serious games in the context of entrepreneurial learning. They confirm that the reviewed games mainly focus on small business management. Issues such as opportunity recognition, the early stage of venture creation or venture investment are not incorporated in the simulations [11].

Our review of entrepreneurial games also included non-digital games or hybrid games. We confirm the previous results that the games simulate the launch and management of a small business. We identified two games that focus on business model development. However, business ideas are mostly simple and have a low degree of innovation (Table 1).

Table 1. Updated and extended review by Krajger and Schwarz (2019), [13]

| Author | Game | Main features | Implementation |
|--------|------|---------------|----------------|
| Lai and Siau (2003), [14] | EBiz | In this online competitive business game students take different roles in a small business company. They compete and interact within a simulated business environment. The winning team is that with the best performance in terms of profit, market share, plant capacity, etc. | Digital |
| Murff and Teach (2009),[15] | Entrepreneurship | This is a computerized non-competitive business game which can be played as a single person or as a single team. It starts with the presentation of a technology-based product concept and simulates the first five years of a technology-based firm. The key element of the game is a repeating decision cycle | Digital |
| Zapata-Tamayo and Zapata-Jaramillo (2015), [16] | Building social communities | Each player will have a specific number of puzzle pieces which belong to different puzzles. The goal of the game is to create a community by solving the puzzles | Analog |
| Shankar (2016), [17] | UDAN | Participants represent start-up teams who have to allocate resources effectively and efficiently by managing the different airport industry stakeholders. Other participants represent different industry and governmental stakeholders | Analog |

(continued)
The business model game “inspire! build your business” is based on a four-stage stage-gate process [5, 24, 25] which integrates central principles and practices from Open Innovation [26] and Lean-Start Up [27]. Milestones separate the four stages from one another. Predefined criteria at each gate help to evaluate the business idea. A decision has to be made if the process should be continued, stopped or the business idea should be modified. Each stage consists of three steps (Create - Test - Improve) and integrates the principles of experimentation, validation, and testing (Lean-Start Up approach).

From a didactic perspective the game follows the practices of entrepreneurship developed by Neck et al. (2014), by combining play, experiential learning, feedback loops, and self-reflection [3, 28]. It is entrepreneurial in that the game is based on real innovative business ideas. Students have to evaluate the business idea, gradually develop a business model and present it three or four times to potential investors. Currently, three versions of the business model game exist. The intended pedagogical objective becomes increasingly complex depending on the target group addressed, ranging from secondary school students to students in bachelor and master programs [13, 29]. Students compete in teams of five with a maximum of 25 participants.

Every version follows the classic sequence of a business game [30]. Inspire! build your business includes a briefing session (which can be prepared in advance or in another lesson), three or four playing rounds and finally a debriefing. The debriefing includes a reflection with a comprehensive generalization in the sense of experience-based learning.
according to Kolb (1984) [31]. In this paper we focus on the game version for high school students. Within this setting, the business model game ends at stage 3 and lasts one day.

The game inspire! build your business builds upon the following game elements (Table 2). Initially, designed as a rule-based physical board game, the first step of digitalization combines the board with a web application and support videos.

| Game elements                              | Implementation                                                                 |
|--------------------------------------------|-------------------------------------------------------------------------------|
| Onboarding                                 | Group building exercise, team construction mini game                           |
| New identities & roles                     | Play the role of an entrepreneur, case & role cards                            |
| Simulating entrepreneurial ecosystem & unpredictable constraints | Dice & game cards                                                            |
| Challenges and quests                      | Challenge cards                                                               |
| Progress                                   | Game Board and moving game pieces                                             |
| Competition and cooperation                | Pitch (of the other groups), teamwork                                         |
| Immediate feedback                         | Pitch & jury, scoreboard                                                      |
| Freedom of choice                          | Develop, design and pitch a business model, game cards                         |
| Time restriction                           | Limited time resources are a key mechanic/principle                            |
| Knowledge transfer                         | Method cards and explanation video                                            |

Table 2. inspire! build your business: game elements and their implementation.

To get an impression and to understand the game design principles, we describe the beginning and the first playing round (see Table 3) of the game. The game starts with an introduction to the game rules, a time outline and a short video about the business model development process. The participants decide on one business idea with five people per idea. As a warm-up a small team building exercise takes place. The teams get a case card that describes a real business idea and a role card, which helps them to take the role of the founder or entrepreneurial team. The descriptions should give the players enough challenge without overwhelming them. Every team gets start resources in points by rolling the dice. This step simulates that founding teams start with a different set of resources.

In the first playing round participants are confronted with opportunities and risks of business model development. A short explanation video introduces the theoretical concept behind. Randomly distributed game cards (by dice) simulate these factors and show that entrepreneurial action is embedded in an environment and stakeholders play an important role. The teams conduct an opportunity analysis by receiving a method card and they prepare an elevator pitch and present their idea in 60 s to potential investors. The teams get immediate feedback on their presentation and receive points from the jury. Teachers from school or external judges can take the role of a potential investor. The last challenge of the first playing round is a short creativity session based
on the principles of the game “Activity”. Teams draw cards randomly with terms from the field of entrepreneurship. They are challenged to explain the term by drawing, presenting or describing the term to their team. If the team is successful, they receive points. The following playing rounds follow the same game design principles.

### Table 3. Timeline of the first playing round

| Timeline: briefing and first playing round |  |
|------------------------------------------|--|
| 30 min | Introduction to the game and business model process by explanation video |
| 20 min | Team building |
| 15 min | Simulation of risks and opportunities (by dice); explanation video |
| 60 min | Opportunity analysis |
| 15 min | Elevator pitch |
| 15 min | Challenge zone: “Activity” |

The instructor's role is to brief the students, execute the digital distribution of cards, play and comment on the explanation videos, and coach the students through the process. The instructor is responsible for keeping the timeline and has to make sure that the teams apply the proposed method cards correctly.

## 4 Methodological Approach and Digitalization

We largely follow the methodological approach from Denning et al. (1989), which states that research should follow four steps, being (i) definition of objectives, (ii) building a hypothesis, (iii) testing the hypothesis, and (iv) interpretation of results [32]. We outline the four steps as well as our approach in Table 4.

### Table 4. Our approach following the structure from Denning et al. (1989).

| Step | Our approach |
|------|--------------|
| Definition of objectives | Reduction in the workload of the game instructor and increase in the quality of experience of the players |
| Building a hypothesis | Digitalization of parts of the game helps the game instructor to focus more on support of the players |
| Testing the hypothesis | Partial digitalization of the game focusing on tracking the game progress and score board and heuristic evaluation |
| Interpretation of results | Discussion of the heuristic evaluation with focus groups and experts and formulating a collaborative report on the evaluation, which is then discussed with the stakeholders of the game |

The overall objective is to reduce the workload of the instructors as well as to increase the quality of experience for the players for the game inspire! build your business. Instructors typically have to take care of many things at the same time, including instructing players, managing content distribution between groups, helping when problems arise, and tracking the game progress. Players on the other hand naturally have
questions and have to queue to ask the game instructor. We hypothesize that if we start with the digitalization of scores and content, instructors can focus more on moderation of the game. As an effect, players get more attention and have a better experience.

We use an engineering approach for testing the hypothesis. We implement a web-based application to support the game instructor and to distribute the content to the teams. Team scores are tracked within the application and access to all material for the game is published in a way that players can access all of it with their mobile phones. With a heuristic evaluation, we evaluate our approach. Graduate students, who are at the time of the study enrolled in a master’s program on game studies and engineering, serve as expert users as they can employ their knowledge from game studies and game development to assess the application and its impact on the game itself. As students of game studies and engineering they build their knowledge on technical as well as social and cultural sciences and can view the game through multiple lenses. Focus groups reflected on the game and the players’ experience before and after the heuristic evaluation and a collaborative report was created. An additional benefit was that the master students were not older than 25 years, so their school experience is still fresh. Finally, we discuss and interpret the feedback from the evaluation and derive the next steps.

With the original game running as a moderated and analog business game with additional board game elements, we decided to aim for an implementation that supports a hybrid game, partially digital, partially analog. Our implementation is based on a responsive web application, which can be accessed by players and instructors through a wide range of devices, including mobile phones, tablets, notebooks and desktop computers (see Fig. 1). Access control as well as content release for different stages of the game is managed by the instructor.

**Fig. 1.** Screenshots of the web application. Currently the application only has a German interface, but translation is planned for the next steps.
5 Heuristic Evaluation of the Game

The evaluation of the game includes the assessment of the application and its impact on the game itself. This includes the analysis of game balancing, luck as a game element, self-informed decision making and choices within the game, transparency of rules and processes, crunch time as core concept of the game, and communication between judges, moderators and teams. Our experts for the heuristic evaluation were recruited from the master program game studies and engineering. 18 students (12 male and 6 female) attended a session before the game, where an overview on the game was given and the evaluation method was discussed. The experts were asked to build groups around the following topics:

- Game balancing and luck as a game mechanic
- New game mechanics
- Interactive tutorial, teach the teacher, game master support
- Gamification and digitalization

Note at that point that the experts understood game mechanics as interaction elements for players, that in cumulo make up the game play. That includes dice rolls, drawing cards, moving pieces on a board, but also on high level pitch decks and communication tasks. Each focus group was encouraged to take a detailed look on their own topic while playing and to take notes on observations. Five days after the game play an additional reflection workshop took place. The experts were asked to discuss their notes in the focus groups and summarize the points noted in a collaborative document. The points were then discussed and detailed by all experts. In the following two weeks experts could add to or update the collaborative document, which was done by eleven experts. This resulted in six written pages of reflections on the game in the mentioned topic categories.

For game balancing and luck as a game mechanic, the focus group identified fairness, transparency and clear rules as a main issue. Those points are interconnected as decisions of the instructors should be transparent and well documented in the web application. Moreover, the rules for the particular tasks should be made explicit in the app. According to the experts, the scoreboard should feature a higher level of details. An example for such a case is the score awarded by judges after the pitch. Experts asked for a detailed description how each of the judges awarded the points instead of results averaged over all judges. In addition to that the experts collected detailed comments on the nature of challenge cards, tasks and the scoring system.

The new game mechanics topic showed possible directions for future development of the game. One main point was that resources that can be spent and earned by the players would allow players to decide on how they approach problems. Judges could be the ones awarding money, which could then be spent by the players. The complete removal of the game board as well as the dice rolling phase was discussed and the introduction of personas for judges and economical context, i.e. market situations, was mentioned.

For the game start the experts recommended an interactive tutorial, which could also feature pre-recorded sessions and best practice examples. Moreover, the experts
recommended a shorter feedback loop on a team level. Teams should be given explanations on what they did well, and what not and their achievements should be put into context of the educational aspects in the feedback loop as well.

For digitalization the experts noted problems when using the system. For instance, the accuracy and timeliness of the scoreboard was criticized, as there were bugs with the automatic score update and the way the instructors update the scoreboard was deemed complicated and cumbersome. The accessibility of the provided content was a topic as the web application on mobile phones was perceived confusing and overwhelming for some players. Moreover, experts outlined the benefit of textual and multimedia content within the app in contrast to PDFs that have to be downloaded. For gamification a lot of creative new directions were pointed out. First of all the app should play a more important role, by providing additional information like (i) judge profile showing their preferences and expectations, (ii) achievements for completed tasks, (iii) featuring a collaborative white board, and (iv) by offering previously recorded ghost sessions as examples or virtual competitors. Furthermore, experts mentioned that resources that can be spent throughout the game (money, points, etc.) would be beneficial to allow more control over the game to the teams, and the pitch phases should include more game-like elements.

6 From Partial to Full Digitalization

Recent developments and the current situation around Covid-19 have shown that in general digital literacy has increased and the society is ready for digital gatherings and over-the-network game playing. Instead of social gathering, which were not allowed in many countries for an extended period, people played games, which they traditionally played as board games or gathered around a table, over the internet. While single games are implemented as computer games with network aspects, like Uno, Monopoly, Risk or Catan, others were made available by the community, like Backgammon, Chess or Rummy. A specialized tool for playing games online together is Tabletop Simulator. Each player must install the software, but then a multitude of games can be played within the tool, which basically provides a table and common game elements like cards and dice. While some of the games are ready to use, like for instance, Chess or Solitaire, provided by the developers of Tabletop Simulator, others are adopted for Tabletop Simulator by the community by adding cards, boards, and other game elements, and implementing rules.

With the prospect of making our game digital tools like the tabletop simulator already offer a way to use existing, well working software to support digitalization. However, for our game the communication in between teams and the creative space has been a core component up to now and, therefore, communication software is another option to use for the game. While game elements are not directly supported, group chats and calls, screen sharing, and collaborative documents are provided and cover the communication and co-working aspects of the game. Possible options include, but are not limited to Discord, Zoom, and Slack. Each of them stands for a category of communication software and has its unique abilities and constraints. All three of them would - in principle - be able to serve as platform for our game, but game instructors
might have extra work with communication moderation, helping players to use the tools and fill the gaps with external tools, e.g. a white board for Discord, or organizing break out rooms in Zoom.

7 Summary and Outlook

The overall feedback provides motivation to continue the digitalization of our business model game. While the experts uncovered inconsistencies and conflicting details, they mentioned that the educational purpose of the game for them is comprehensible and understandable. They further encourage to rely on extensive user feedback and user studies. With the first digitalization stage, instructors are supported in organizing and distributing materials, but this can further be simplified. That would allow them to focus on their role as coaches to guide the players through the game. A further step of development could be the integration of multimedia content (e.g. videos) and more interactive elements in the application, especially for the onboarding in the form of interactive tutorials. Potential also exists in applying additional game mechanics such as timekeeping and resource management to further improve user experience.

Feedback showed further that although the digitalization was kept on a small level, common software development problems reduced the usefulness of the application. Quality assurance methods have to be implemented in the development process, like bug tracking, unit and interface tests and focused user studies to make the interface more intuitive and useful. The level of detail regarding the information available for the players, however, requires additional evaluation. While the experts agreed in the reflection workshop on more information is better for transparency and fairness, they noted that the information already available overwhelmed them. Additional studies should make sure that the interface of the application is intuitive, provides the information needed in a context sensitive way, and offers additional information on request.

For now, we decided to follow the track chosen with the hybrid version and digitalize further along the lines we anticipated: reducing the amount or organizational work for the instructors and administrators by distributing content digitally, and managing the progress of the game in the app. Additionally, as a result from the experts’ comments we will incorporate an additional feedback loop on the usefulness of the app by players and instructors. However, with the acceptance of video communication software and digital collaboration suites, the game can be levered to a fully digital version.

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