

# A Serious Game as an Online Application for Dynamic Business Model Adaptation

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**Abstract.** *Adapt or Die!* is an educational online application designed in form of a serious game and aims for teaching and guiding the business model (BM) creation process in volatile, digital ecosystems. The prototype guides up to 20 players dynamically through the key building blocks of a digital BM and makes them solve quiz questions, adapt to change, understand evolutionary BM patterns, or master creative challenges together on the web. The artifact was developed following the Design Science Research paradigm as well as game design principles and gains from the positive effects of games to foster creativity, motivation, and multifaceted thinking. The interaction and dynamics in the application harmonize with the increasing market complexity and specifics of digital BMs in Digital Darwinism and are meant to create a vivid learning experience.

**Keywords:** Serious Game, Entrepreneurship Education, Digital Darwinism, Business Model Creation, Evolutionary Adaptation.

## 1 Problem Statement

The rapidly progressing digital transformation provokes the need for continuous business model (BM) adaptation to cope with the volatile, uncertain, complex, and ambiguous (VUCA) environment in order to survive in the market [1, 2]. This process of variation and selection to better adapt to environmental changes is comparable to the mechanisms of biological evolution and is therefore known as “Digital Darwinism” [3]. Thus, it is not the competitor with the most capital, power, or experience that prevails, but the most adaptable to change [3]. Teaching the importance of adaptable BMs and guiding the adaptation process is a big challenge that needs to be anchored in entrepreneurship education [4]. According to Ashby’s *law of requisite variety*, which was derived after the observation of self-regulating biological systems, only variety can absorb variety [5]. In more tangible terms, for a system to be able to deal with the diversity of challenges that its environment produces, it requires a repertoire of responses that are at least as nuanced as the environment’s variety [6]. Consequently, more dynamic instruments to teach BM adaptation are needed, since interactive and complex tools that increase the variability of the adaptation process are better suited to

cope with the high variety of a VUCA environment [4]. We, therefore, decided to develop an educative serious game (ESG), since game mechanics can foster dynamic interaction of its players [7] with a high variety of creative outcomes in the context of BM ideation in Digital Darwinism [8].

## 2 Design of the Artifact

*Adapt or Die!* is an ESG that was designed in an iterative process along with the Design Science Research (DSR) paradigm [9]. Its goal is to ensure that artifacts are designed based on actual needs and requirements (the *relevance* of a more dynamic tool for BM adaptation in entrepreneurship education [4]) while being built upon applicable knowledge from grounded theories, frameworks, and methods (*rigorous* research such as BM adaptation as an evolutionary, pattern-based process [10]). Principles of game design according to *Schell* [11] and *Salen & Zimmermann* [12] guided the iterative design process from a physical prototype [8] to the then further evolved multi-player online application presented here. Along that way, several offline and online playtests with students as tissue testers [13] led to iterative evaluation and improvement of the ESG, i.e., by embedding additional playing elements such as the digital BM canvas' building blocks [14], evolutionary mechanisms [3] or BM pattern cards [10].

### 2.1 Game Design

**Intended User Groups.** The ESG is intended for use in academic entrepreneurship education so that it is aimed in particular at students with basic knowledge of business models and their adaptation and innovation. In the future, after further development, evaluation and adjustment, it is also envisaged to use the online application for practitioners (e.g., start-up teams) in order to provide them with a creative framework and stimulus for BM ideation.

**Game Play.** The goal of *Adapt or Die!* from the players' perspective is to be the first one to reach the goal field on the digital game board after proving the BM's robustness along with action card challenges and to work out all nine building blocks of a digital BM by filling the digital BM canvas [14] and thus win the game. On that way, the players have adapted their BM to unexpected events like a lockdown, transferred biological concepts such as niching to an economical context, solved interactively creative tasks (e.g., ideating a visionary BM slogan), or answered quiz cards to enrich their knowledge in entrepreneurship [8]. The four basic game design categories *story* (Digital Darwinism as a permanent threat), *mechanics* (chance; interaction; a variety of play elements), *aesthetics* (colors, symbols), and *technology* (online application built with unity engine) have been elaborated based on sound game design principles [11, 12] to create a positive play experience and thus a stimulating ESG [8, 15].

**Technology.** The ESG online application is built on the Unity game engine, which provides extensive tools for the design (e.g., animations, graphical frameworks) of web-

based games. The codebase C# and the extension of the network functions by Photon Unity Networking 2 (PUN2) allow the free common playing with up to 20 players on the internet and the cross-play of various operating systems (Windows, Linux, macOS) in parallel. Hereby, the game logic is executed locally; the server used acts only as an interface for data exchange and for players to get together. The C# scripts are object and class-oriented, for example, the GameManager class handles cross-game data as well as the game flow itself, whereas the HandleVoteClick class manages voting and the UIManager class is responsible for displaying items such as action cards.

## 2.2 Feature Description

The following Figure 1 shows a condensed view of the individual elements integrated into the online-application, which players can access after they have given themselves a nickname and joined a common lobby on the entry mask. A screencast of the artifact is available here: <https://vimeo.com/686606479>.



Fig. 1. Overview of Game Elements

Throughout the game, the digital game board is displayed in the center on a wooden-looking background along with the cube in the upper left corner and the player's nickname whose turn it is. The game token moves then around according to the dice eye count on the game board with the player's name attached to it (e.g., "Darwin" standing on the starting field). Above and below the game board the five moves that each player goes through within one turn are illustrated. The different action card types a-d (1) correspond to the colors on the game board and the respective action color of the instruction, e.g., blue in the case of a quiz card (3). The digital BM canvas is only indicated at the right edge of the screen and can be dragged into the game field using the arrow for an overall view (2) and is then filled in. Input masks (4) allow the answering of concrete questions about the BM as a free text field with memory function.

Notes on the individual building blocks of the designed business model are noted on the digital BM canvas (2) and can be viewed repeatedly during the course of the game and saved locally at the end of the game for possible further work with the results – at that time all its core elements have been discussed and reflected.

Although *Adapt or Die!* can be played silently in a single-player mode, we recommend that 3-5 players meet together for the gameplay in a video conference for more lively discussion as well as collaborative ideating and commenting on thoughts. Previously attributed roles may force players to step into the perspective of a specific stakeholder for the BM and potentially uncover hidden potential or unrevealed conflicts of interest while discussing with players acting from other role perspectives.

### 3 Significance to Research and Practice

The ESG adds value to *practice* by providing an innovative IT artifact that enables the collaborative development of digital BMs on the internet without requiring the physical presence of its player in the same room. The different game elements stimulate creativity and should contribute to a pleasant learning atmosphere, which makes the adaptation of BMs and their necessity in VUCA environments tangible. Thus, the online-application contributes to dynamic, interactive, and playful entrepreneurship education.

The *research* significance can be seen in the linking of so far largely fragmented, proven approaches to support BM ideation processes: The approach of pattern-based BM innovation widespread in research [10] is extended by the evolutionary perspective of BMs adapted to the environment, whereby this perspective explains that patterns that are particularly well adapted to the (digital) environment prevail on the market (through reproduction) [3]. Thus, the pattern-based BM innovation is extended by a novel perspective inspired by biological evolution. At the same time, elements emerging from previous BM research, such as the core elements of digital BMs [14] or creativity-enhancing methods on the action cards [e.g., 16], are embedded into the gameplay.

While *Adapt or Die!* has been iteratively developed along the DSR process, the IT artifact itself represents additionally a medium for experiencing the DSR paradigm, because it acts as a mediator between practical problems of its players (regarding BM adaptation) and the teaching of entrepreneurship knowledge and experience - thus the ESG serves as a bridge between rigor and relevance in the sense of DSR.

### 4 Evaluation

In previous iterations, the ESG was successively evaluated with entrepreneurship students in playtests [13] to continuously improve the game design [8]. The prototype as an online application presented here was evaluated qualitatively in three iterative playtest sessions, following the example of Eckardt et al. [15] with three to four students each, who played the game collaboratively for the first time under the observation of the research team and shared their experiences during the game and in a subsequent interview. The focus was on the bug-free cross-operating system playability, an

enjoyable learning experience and the easy-to-understand gameplay without a moderator.

Feedback from the playtesters led, for example, to a harmonization of the color concept between the game board and the info texts, a revision of the instructions on the play elements, an integrated voting mode for awarding game points collaboratively, and the adjustment of time limits for processing action card challenges, as well as the elimination of various technical bugs that had occurred. With three to four players the playing time for one run is about 90 minutes. Despite the technical possibilities for a cross-play with up to 20 participants, we recommend a team size of about three to five participants for interactive discussions in a time frame of about one lecture block.

## 5 Outlook

Further planned playtests will also collect quantitative feedback from students and measure the impact on learning success of the innovative teaching instrument compared to frontal teaching in a control study. In addition, the prototype is currently still limited by its design in German and could therefore be translated into other languages, especially English, and might be enriched with further content (e.g., additional action cards or video content). The design of novel learning material to be integrated is planned as a co-creation process with students as future users of the application [17] in order to foster a need-oriented approach.

In the long term, extensive adaptations in the game design would be possible, for example through AI-based players or adaptive mechanisms that adjust the difficulty of the action card challenges to the competence level of the player. Nevertheless, the prototype presented here in its current design can already provide a variety of impulses for BM adaptation and convey findings from BM research in entrepreneurship education.

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