Proceedings of the 2023 AIS SIGED International Conference on Information Systems Education and Research

SIGED: IAIM Conference

12-12-2023

# Designing a Business Model Ideation Tool for Entrepreneurship Education

Ricarda Schlimbach
*Heilbronn University, Germany*, ricarda.schlimbach@hs-heilbronn.de

Tim Lange
*Rotterdam School of Management, Erasmus University*, dvlachopoulos@rsm.nl

Thorsten Schoormann
*Rotterdam School of Management, Erasmus University*, bode@rsm.nl

# DESIGNING A BUSINESS MODEL IDEATION TOOL FOR ENTREPRENEURSHIP EDUCATION

Ricarda Schlimbach
Heilbronn University, Germany
ricarda.schlimbach@hs-heilbronn.de

Tim Lange
Felix Wagner
Susanne Robra-Bissantz
Chair of Service Information Systems
TU Braunschweig, Germany

Thorsten Schoormann
University of Hildesheim &
Fraunhofer ISST Dortmund, Germany

**Abstract:**

Promoting business model ideation skills is imperative in contemporary entrepreneurship education and beyond. Emerging (software-based) tooling for such innovations, however, often neglects the unique characteristics faced for educational purposes. To address this, we designed a novel artifact for teaching business model ideation in digital learning environments. By drawing on knowledge from pattern-based innovation, creativity, and conversational AI, we implemented a personal ideation companion (PICO). Our companion navigates students through five ideation phases, encouraging them to ideate business models in a divergent-convergent thinking style. The web-based tool covers diverse features on an educational, social, and motivational layer to teach business model basics and to promote creativity and versatile thinking along the ideation process. Based on our multi-year DSR project, we report on a situational instantiation and provide abstracted guidelines for its design and implementation in (entrepreneurship) education, which has been evaluated in several formal and informal learning scenarios.

**Keywords:** Entrepreneurship, Education, Conversational AI, Conversational Agent, Educational BMDT.

## I. INTRODUCTION

“*If at first, the idea is not absurd, then there is no hope for it.”—Albert Einstein.*

In today’s continuously transforming world, the ability to generate novel ideas is increasingly important. Ideas enable organizations to adapt outdated business models (BMs), react to exogenous shocks, and create alternatives to current ways of doing - for that reason ideation is a vital area of innovation (Frankenberger et al. 2013). Skills concerning idea generation are relevant beyond disciplinary boundaries. An entrepreneurial mindset, including spotting opportunities for businesses and being creative, does typically evolve already in the early stages of people’s lives, not only during professional endeavors (Lindner 2018). Training that mindset is particularly important to students because they will be confronted with spurring innovation all the time in their future careers (Bell and Bell 2023). Approaches to guide and practice corresponding skills are therefore a fundamental pillar in (entrepreneurship) education in order to put graduates in the position to start their own businesses or innovate incumbent companies (Hameed and Irfan 2019). While related areas already succeed in offering digital or hybrid education formats, online entrepreneurship faces only limited adoption. This is especially hard in times of growing remote learning and distributed work (Liguori and Winkler 2020).

Research on digital entrepreneurship (e.g., Nambisan 2017; Recker and Briel 2019) and BM innovation (e.g., Ebel, Bretschneider, and Leimeister 2016) have already pointed to the promising role of supporting digital infrastructure. In the context of BMs, so-called business model development tools (BMDTs) are among the prevailing software artifacts (e.g., Bouwman et al. 2020) that offer features for communication, collaboration, documentation, experimentation, and creativity regardless of time and location (Osterwalder and Pigneur 2013). Although several BMDTs exist (see overview in Szopinski et al. 2020), teaching BM ideation as part of entrepreneurial education has unique characteristics that need to be considered: First, research often focuses on advanced phases of BM innovation, leading to a need for investigating the early phases which are relevant to prepare (future) entrepreneurs to develop, refine, and validate ideas (Hoveskog, Halila, and Danilovic 2015). Second, while ideation should be taught systematically to increase its efficiency (Ogutveren-Gonul 2019), only a few BMDTs implement features to guide users through different innovation stages or benefit from disruptive technologies like generative AI. Third, Szopinski et al. (2020) call for research on investigating specific user characteristics and purposes in the context of education compared to general business settings. Against this backdrop, we seek to create a contextualized tool capable of teaching BM ideation and ask: *How to design an educational BMDT that guides and trains the process of generating new ideas?*

To answer this, we conducted a design science research (DSR) project in which we built an IT artifact in the form of a software tool entitled PICO (your personal ideation companion) that is enriched by conversational AI. In the tradition of knowledge accumulation, we applied pattern-based innovation, divergent-convergent thinking, and motivational theory to deduce general requirements and make informed decisions concerning its implementation. We evaluated the artifact's usage and added value in several learning scenarios (altogether over 70 students and 10 practitioners) to then derive guidelines for implementing BMDTs in educational settings.

## II. RESEARCH BACKGROUND

### Business Model Ideation and Supporting Software-based Tools

Among different interpretations of the BM concept is the view that BMs enable innovation as they pose a valuable unit for analyzing a current business as well as a starting point for employing innovation approaches. Broadly speaking, BM innovation can be defined as a process of designing a new or modifying an existing way of doing business (Schneider and Spieth 2013). In this innovation process, several phases are crossed (e.g., Ebel et al. 2016; Hoveskog et al. 2015), including initiation to investigate the actual need and understanding of the environment, ideation to create possible solutions, integration to operationalize selected ideas, implementation to bring the solution into the market, and management to monitor and evaluate results. From a pedagogical perspective, the process covers the highest cognitive stages of evaluation and creation (see Bloom 1956). Although ideation is essential, prior literature pointed to the need for advancing the early phases in particular as our understanding of how to conduct ideation is rather limited (e.g., Björk 2012). This deficit hinders (future) innovators, such as students, from developing abilities to create, refine, and validate new BM ideas (Hoveskog et al. 2015).

Supporting tools provide a promising approach to overcoming these challenges. Like in adjacent innovation fields, scholars and practitioners stressed especially the potential of software, in the form of BMDTs (Szopinski et al. 2020; Veit et al. 2014). Existing BMDTs provide features that foster, for instance, creative business modeling (Voigt et al. 2013), BM validation (Dellermann et al. 2019), and BM reflection (Schoormann, Stadtländer, and Knackstedt 2021). Despite the growing availability of such tools, there is limited research on their abilities in educational settings. Bouwman et al. (2020) even called for *"using tools in BM education [to investigate] what can be learned from student users [and how it can] be included in curricula, where there is less background knowledge on business topics"* (p. 417).

### A Three-Layered Framework as Conceptual Foundation

Any interaction is shaped by the interactors' relationship, matched needs and provided services (Geiger, Robra-Bissantz, and Meyer 2020). Applied to our specific context of teaching and training BM ideation, we propose that a tool needs to cover aspects of educational, social, and motivational layers (Benner et al. (2022). The educational layer involves the selection of learning goals and the creation of corresponding tasks (Bloom 1956; Krathwohl 2002). Following Benner et al. (2022) the social layer determines the role and relationship of the tool to the user with underpinning theories, such as social presence theory (Lowenthal 2009) and social agency theory (Shapiro 2005). The motivational layer seeks to motivate and prompt users to apply a tool. This can be achieved by adapting game design elements that draw on the self-determination theory (Ryan and Deci 2000) and hexad player types (Tondello et al. 2016) to respect individual drivers and learning preferences (Steinherr and Reinelt 2022). Referring to our context, the interplay between these layers is crucial, as the selection of appropriate learning goals in the educational layer will influence the social and motivational outcomes, too. In turn, the social layer will influence the motivational layer, as the role of how a user interacts with a tool depends on the selection of appropriate game design elements (Benner et al. 2022). Overall, our educational BMDT aims to provide a user-centered and engaging experience, by considering the interplay of these layers.

## III. RESEARCH DESIGN

DSR is an auspicious approach for designing digital BM tools (Schoormann et al. 2021; Veit et al. 2014). To ensure relevance and rigor, we completed three design cycles (Kuechler and Vaishnavi 2008) lasting about half a year each to build our educational BMDT, PICO (see Figure 1).

| DSR Method | Cycle 1: Educational layer | Cycle 2: Motivational layer | Cycle 3: Social layer | Outcome |
|---|---|---|---|---|
| Awareness of Problem | Need for educational BMDTs that support business model ideation | Analysis of insights from Design Cycle 1 | Analysis of insights from Design Cycle 2 | (Refined) Problem situation and design requirements |
| Suggestion | Conceptualization and adoption of approaches from pattern-based ideation, thinking styles | Conceptualization of literature and five interviews (40-60 min.) (on motivational features) | Conceptualization and adoption of knowledge from learning companions/social interaction | |
| Development | Implementation as a Java-based tool | (Co-created) Prototyping to create several prototypes | Implementation of a full-stack-web-application with a digital learning companion | (Refined) Design features and artifact |
| Evaluation | Usability evaluation (Think-out-loud studies) | Evaluation of prototypes (workshop, 17 participants) | Evaluation of web-application (application/use, 14 users) | Qualitative feedback on applicability |
| Conclusion | (+) Tool features are feasible; (-) Need for increased usability and motivation | (-) Need for additional interaction | (+) Increased BMDT use, increased interaction, … | Results, reflections, and insights |

Figure 1. Iterative Artifact Design and Evaluation

### Design Cycle 1

We started with the formalization of the actual problem. As mentioned in the Introduction, a digital solution for learning BM ideation was required to respond to changing learning environments, such as due to the Covid-pandemic. From our review of prior research, we conceptualized design requirements for (1) more contextualized tools to respect students'/entrepreneurs' characteristics, (2) features for systematic guidance through ideation processes, and (3) tools that focus especially on the early stages of BM innovation, particularly ideation. To suggest a solution, we draw on knowledge from pattern-based innovation as well as divergent-convergent thinking, which was then implemented through a Java-based BMDT. During the evaluation, five potential users tested our initial BMDT individually, investigating user interface, functionality, comprehensibility, bugs and learning content by articulating their thoughts with the think-out-loud method (Someren, Barnard, and Sandberg 1994). Each run lasted 1-2 hours, followed by an open discussion on the evaluation criteria and improvement suggestions. We did this in three rounds (one per month) and embedded feedback into a revised artifact. This is then tested again by each of the participants to iteratively improve the BMDT's design (Schlimbach, Christmann et al. 2022).

### Design Cycle 2

Based on the evaluation of the learnings from the first cycle, we observed the need for an improved UI and additional motivation to enthuse students. Therefore, we made use of motivational hexad archetypes (Tondello et al. 2016). We reviewed the literature on motivational features from these hexad types and analyzed papers covering the educational context in particular (e.g., Steinherr and Reinelt 2022). We combined the findings with five interviews; practitioners and academics who had researched and/or implemented features from the hexad scale into digital learning tools. The transcribed interviews lasted 40 to 60 minutes and followed a semi-structured interview guide to cover motivational drivers and archetypes, suggested features, and potential hurdles for the given learning context. We then involved students as co-creators to design low-fidelity-prototypes in Figma for the derived motivational hexad design features, whereby each prototype covered two similar archetypes in learning (Steinherr and Reinelt 2022), namely 'achievers & players', 'free spirits & disruptors', and 'philanthropists & socializers'. In doing this, we respond to calls for using software tools in BM education and curricula for students with varying backgrounds and course scenarios (e.g., Bouwman et al. 2020; Szopinski et al. 2020). The three prototypes were tested in a workshop with undergraduate students from various majors and prioritized features to be implemented (Schlimbach, Behne et al. 2023). As a result, the workshop revealed the need for additional social interaction and sparked the idea of embedding a socially bonding chatbot.

### Design Cycle 3

To respect the need for social interaction, we followed the suggestion from the literature of chatbot-based learning companions and implemented a web application by reusing design knowledge (Khosrawi-Rad et al. 2022; Schlimbach, Windolf, and Robra-Bissantz 2023; Tolzin et al. 2023). We tested the artifact's applicability in two entrepreneurship bachelor courses with 14 students each and observed the tool interaction before collecting feedback in a follow-up group discussion on impressions and learning experiences. As our educational BMDT achieved robust results, we started to perform a set of ex-post evaluation episodes to derive learnings from observed aspects that benefit successful implementation and the tool's adoption in the respective ideation setting. In these episodes, groups of students and BM innovators were confronted with different (real-world) challenges, such as creating novel business ideas or re-designing existing BMs. We discussed with the participants involved the expected value in using the tool before and after its application in class to spot generalizable overlaps and differences that might be aligned to the specific setting. By reflecting across all building and evaluation activities, we were able to synthesize observations, tensions, as well as recommendations that guide the design and implementation of tools from a similar class within and beyond educational environments. In the next section, we present the consolidated results and findings across all design cycles.

## IV. ARTIFACT DESCRIPTION: AN EDUCATIONAL BMDT

### Conceptualization: Design Requirements and Goals

On the *educational layer*, a prerequisite is to establish a common understanding of BMs and the ideation process. Following Bloom's taxonomy (1956) on learning levels, advanced knowledge and skills are built upon solid foundations (i.e., shared understanding of a topic). To help students get advanced BM ideation skills, a tool needs to teach them to *understand* the underlying value creation architecture of BMs and *apply* their constituting building blocks (e.g., Osterwalder and Pigneur 2013). Based thereupon, abilities to *create* new ideas and *evaluate* ideas are trained, whereby various knowledge dimensions (e.g., factual, conceptual, and strategic knowledge) are touched upon (Krathwohl 2002). Accordingly, we formulate the first requirement: ***DR1*** *– Establish a common base of knowledge.*

Because ideation contains different activities, such as spotting opportunities, generating alternatives, creating initial ideas before validating and selecting among these (Lindner 2018), appropriate guidance is required. To navigate through the process, BMDTs should provide students with guiding structures, versatile perspectives and dynamic filtering (Müller-Wienbergen et al. 2011) to explore and evaluate ideas. Studies have shown that the use of multiple thinking methods as well as understanding the types and sequence of thinking methods improve the effectiveness of ideation (Ogutveren-Gonul 2019). Moreover, understanding different thinking styles, such as convergent (i.e., evaluating ideas) and divergent (i.e., opening the thinking process to surprising knowledge contexts) thinking contributes to exploring a broader range of options while ensuring that the ideas are evaluated and refined appropriately (Müller-Wienbergen et al. 2011). The distinction between the two thinking styles is reflected in numerous problem-solving models for creative solution finding (e.g., Gassmann, Csik, and Frankenberger 2014). Accordingly: ***DR2*** – *Guide learners throughout the ideation process and thinking modes.*

Following Gassmann et al. (2014), many BMs emerged from the recombination of existing components. The idea of pattern-based innovation through analogy building and reusing has a long history. Until today, research assumes that less than one percent of innovative technologies are novel in their mechanics, but rather make use of existing patterns that are linked together in a novel way or embedded in other contexts (Gassmann et al. 2014). Schlimbach et al. (2022) conclude that connecting and recombining patterns is an evolutionary principle that leads to BM innovation. To facilitate the purposeful recombination of ideas, appropriate tools are needed. These, for instance, should allow for categorizing and organizing knowledge items (Müller-Wienbergen et al. 2011) to help learners identify, connect, and recombine ideas in a structured manner. Accordingly: ***DR3*** – *Prompt learners to connect and recombine ideas.*

Ideation is a collective endeavor and research in ideation-related streams has stressed the importance of interaction and collaboration. On the *social layer*, socializing learning environments are demanded to support learners in interacting and collaborating. Social presence theory suggests that communication media (Short, Williams, and Christie 1976) can differ in the extent to which they convey a sense of social presence (i.e., the degree to which people perceive that they are interacting with real, live individuals). In the context of education, the theory posits that the level of social presence conveyed by a communication medium can impact how people perceive and respond to a tool. Social agency theory (Shapiro 2005) assumes that people's sense of agency (their ability to influence their environment and bring about desired outcomes) is impacted by their interactions with others. The theory suggests that individuals have a variety of agency-related goals that they pursue in social interactions – for example, they may seek to establish their competence, build relationships, or exert control over their environment (Ryan and Deci 2000). Based on these theoretical lenses, a gamified conversational tutor to support learners in digital learning environments might be helpful (Benner et al. 2022). Research has shown that people behave socially towards machines and even bond with them as long as their design is humanoid (e.g., Nass et al. 1994). Common ground in conversational agents, as described by Clark and Brennan (1991), favors positive emotions toward them (Elshan and Ebel 2020). Due to the *persona effect* (Lester et al. 1997), the presence of a human character in an interactive learning environment can have a strong positive effect on the perceived learning experience and outcomes. For that reason, conversational and socially bonding learning companions (LCs) gain momentum to interact and collaborate with students in the role of teammates (Khosrawi-Rad et al. 2022). LCs have shifted the perspective from functional assistants to human-like actors that establish close social ties and a low power distance towards their users. By allowing learners to interact and collaborate with real or digital entities, ideation as a collective endeavor can be supported. Besides, incorporating an interactive module might enable the creation of a more human-like learning environment that promotes social conduct and learning success. Accordingly: ***DR4*** – *Enable learners to interact and collaborate with real/digital entities.*

Especially in educational settings, on a *motivational layer*, it is essential to reflect on different styles of learning (preferences), levels and individual drivers of motivation (Plass and Pawar 2020). Motivation drives IT adoption and recurring technology use (Davis 1993) and thus can prompt the use of educational BMDTs, too. Gamification has proven to be an effective approach to incentivize and motivate learners, drawing on established theories such as self-determination theory (Ryan and Deci 2000). The hexad model (Tondello et al. 2016) offers a standardized scale for user types that takes into account their motivational drivers and preferences beyond gaming, comprising six archetypes: Player, Free Spirit, Achiever, Disruptor, Socializer, and Philanthropist. Specific design recommendations for motivating each archetype in gaming are provided (Berehil 2022; Tondello et al. 2016) and recent research shows that different learning preferences (e.g., solving a task collaboratively vs. competitively) are also reflected in these hexad archetypes (Steinherr and Reinelt 2022). In consequence, from a motivational viewpoint, mechanisms to ensure learner motivation as well as functions to consider individual learner orientation and implement motivational design elements (Benner et al. 2022) are required. Accordingly: ***DR5** – Consider different types of learners and their drivers for motivation.*

## Instantiation: Situational Artifact and Its Features

We translated the five DRs into features to instantiate our educational BMDT, named PICO (see Figure 2).

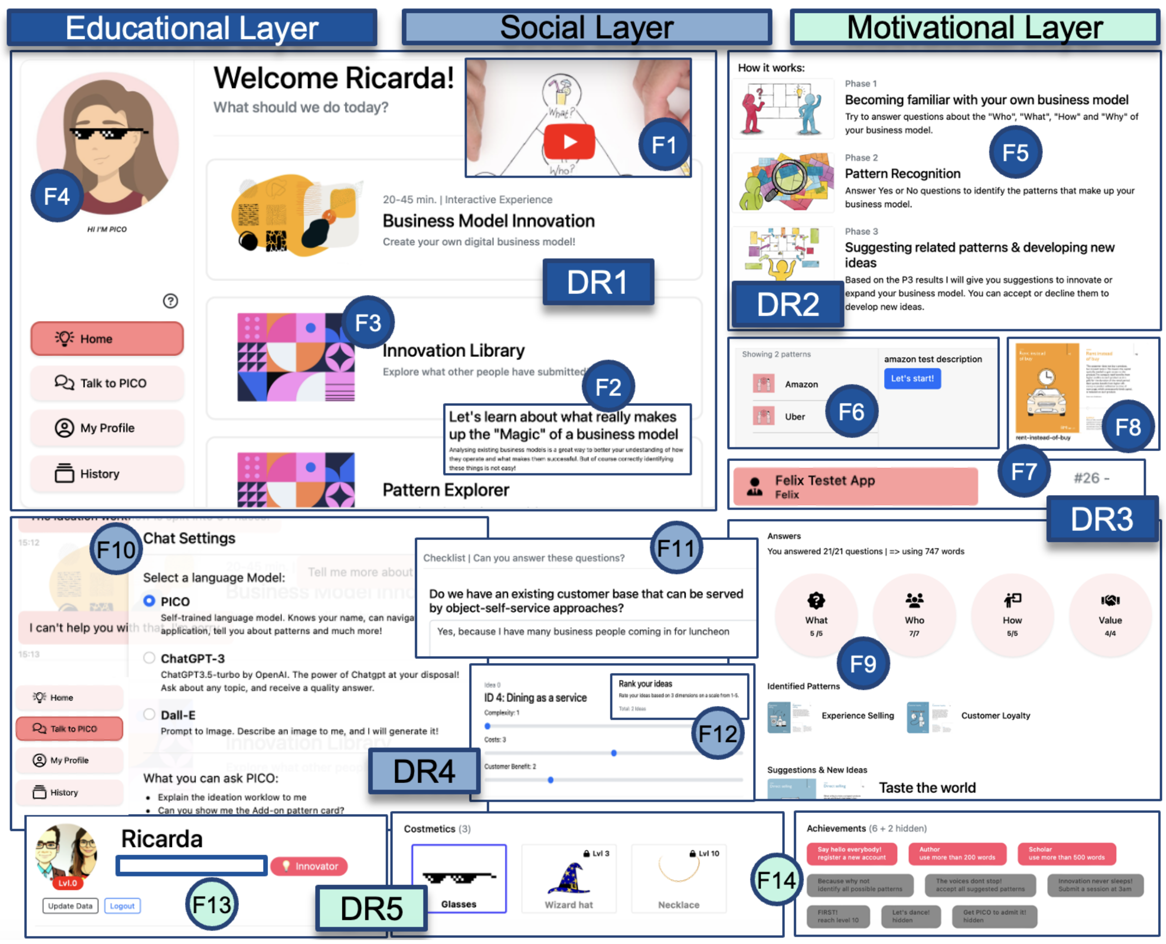


Figure 2. Demonstration of PICO (Web-based BMDT)

The BMDT is built as a web application with five main components: Frontend, Backend, Database, Rasa and Rasa NLU. The Frontend handles the UI and user actions through JavaScript VUE Framework, while the Backend is built on a restful API using the Python Django framework to handle data requests and queries. The embedded chatbot uses Rasa NLU, which communicates text-based via natural language and is integrated with more specialized tasks through the Python Rasa SDK. The chatbot thus uses multiple frameworks to provide seamless natural language communication and dynamic data processing.

To establish a common base of knowledge (**DR1**), we embedded an introductory video tutorial *(F1)* that explains the core BM elements and BM ideation. Students then define a BM together with PICO *(F2)* to apply the gained knowledge or walk through a sample ideation journey exemplified for Amazon and Uber (F6). A joint innovation library *(F3)* with ideas from all users creates a common knowledge space beyond single teams. The ideas might be discussed in a broader setting. This way, students are guided (*F1-F3)* from the mere understanding of BM basics to advanced skills of evaluation (Krathwohl 2002). Moreover, PICO serves as an ideation companion that navigates throughout the tool *(F4)*, tutoring key facts and providing advice for each phase along the ideation process *(F5)* (**DR2**). We reused design knowledge for LCs (Khosrawi-Rad et al. 2022) and integrated social cues, such as a human identity (avatar, self-referencing and introducing as ‘Pico') and informal, natural language to create a social presence (Benbasat et al. 2010). The LC helps to connect and recombine ideas (**DR3**), as it is linked to a library with 61 BM pattern cards (Gassmann et al. 2014) *(F8)* and aligns the student's idea with patterns via targeted interrogative questions on the business logic. PICO suggests still unconsidered BM patterns and encourages their transfer to further evolving BM ideas to be labeled by IDs *(F7)*. Inspired by 21 questions wrapped around the four business logic's core dimensions *(what, who, how, value)* (Gassmann et al. 2014), ideas are aligned with a BM's core elements to then result in merged new ideas *(F9)*.

As the interaction with real or digital entities is important (**DR4**), several social features were implemented. These include the option to prompt PICO in a chat with situational knowledge on the ideation process or to interact with ChatGPT-4 or Dall-E as an embedded module to jointly elaborate on BM ideas and generate pictures, such as a logo *(F10)*. Depending on the selected BM patterns, individualized and more detailed questions help inspire creativity *(F11)*. PICO encourages learners to interact with peers by evaluating their ideas comparatively by setting sliders *(F12)* for assessing the impact and feasibility of each idea.

To consider different types of learners and their drivers for motivation (**DR5**), we employed gamified elements, such as badges and customizable user profiles *(F13)*. Gamification motivates learners by providing a fun and engaging environment (Benner et al. 2022). Our BMDT responds to all motivational drivers of hexad (Tondello et al. 2016): We combine competitive elements (e.g., generating the best idea), with accomplishments (e.g., an innovator batch for a certain number of ideas), collaborative aspects (e.g., interacting in the chat), as well as knowledge sharing in the library, two learning modes (tutorials along well-known companies and their BMs versus free topic) and room for disruptive ideas *(F14)*.

# V. DEMONSTRATION AND EVALUATION

## Overview

Considering the socio-technical nature of our artifact that captures technical, task-related, and learner aspects, we performed – besides ex-ante evaluations from each design cycle – three *ex-post* evaluation episodes (Venable, Pries-Heje, and Baskerville 2016) to investigate the artifact's applicability and value as well as to obtain impulses for improvement.

We position episodes EP1-EP3 as naturalistic because they took place in real university courses and/or with practical partners that aimed to create BM ideas (see Figure 3).

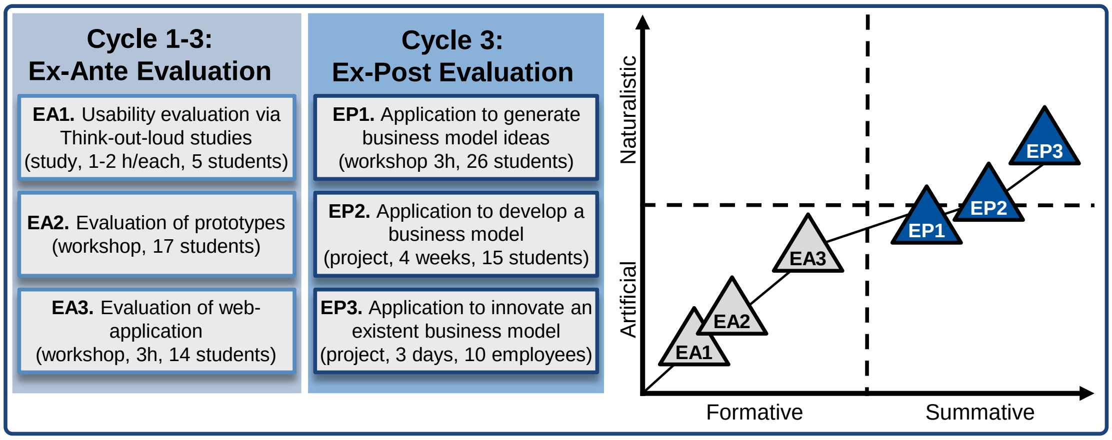


Figure 3. Overview of Evaluation Episodes (Blue = This Paper's Focus)

## Episode EP1 – Workshop to Generate Business Model Ideas

To apply our educational BMDT in a setting without our supervision (i.e., applying the tool by external lecturers), we provided the tool and some instructions to two lecturers from another university in Austria. In a 3h workshop, 26 international students from a master course on 'Entrepreneurship and Innovation' developed a BM for an idea competition (with incentives from a company). As the students had no prior experience with our BMDT, a short introduction to PICO was provided in an analog setting. Then, they applied PICO and discussed its value, room for improvement and other experiences in a follow-up session. The latter provided us with their insights for using BMDTs in teaching scenarios.

The feedback revealed that the learners' value-in-use (ViU) (Bruns and Jacob 2016) focuses on productivity and competitiveness. Students prioritize generating ideas quickly and winning the competition, valuing incentives over learning. Teams were hesitant to share ideas *(F3)* due to fear of *"robbing our ideas to make the other team win the competition."* The lecturers noticed students lacked clarity on shared results' viewing rights in PICO (not noticing that it is possible to share interim results only with their team). Enhancing transparency and restricting collaboration to the team level are thus important for the tool introduction. Improved UX/UI, including chat capabilities matching or surpassing ChatGPT *(F10)*, was named essential for its adoption. From the lecturers' perspective, the ViU lies especially in artifact innovativeness and its social value in interacting *(F4, F11)*. Both argue that hybrid interaction with digitally connected participants and engaging with chatbot Pico provide enhanced learning experiences *"to not only talk about conversational AI in class but interact with it to learn hands-on".* However, lecturers observed that the guided ideation process *(F5)* became time-consuming, leading to *"exhaustion and frustration"* after a while, which might have been intensified by the workshops' context (an evening course after a long workday). They thus suggest splitting up the ideation process *(F5)* into smaller parts and reducing the number of mandatory questions *(F9, F11)* to be answered per phase.

Overall, we see the necessity to balance students' desire to win (for grades and prizes) with lectures' aim for meaningful learning, requiring communication of expectations and the anticipated value in using PICO for everyone. Didactic guidance is crucial for maintaining a schedule and preventing exhaustion. Students struggle without clear instructional cues but benefit from the applied "hands-on approach" with PICO.

## Episode EP2 – Project to Develop a Business Model

Besides, PICO accompanied larger projects across four weeks, in which a group of 15 students was confronted with the task of innovating the BM of the university's cafeteria. We introduced the tool – see also EP1 – and attended the project to collect insights from the use and feedback from team discussions.

Students claimed to have walked through the sample ideation journeys of Uber *(F6)* for their semester projects *“to quickly understand the core idea*”. Besides, all students voluntarily engaged with our embedded conversational companion *(F10)*, drawn by its ability to inspire and generate ideas that hadn't been previously considered. Some even asked for an additional lecture (in their free time) to meet the developer because they were curious about the underpinning technology. They appreciated the “*intuitive and social design” (F4)* and perceived the interaction as more collaborative than ChatGPT. This might be attributed to its personalized addressing, use of emojis, and small talk that creates a *“sense of social connection”.* The contextual knowledge and multimedia integration (e.g., Dall-E *(F10)* and explanatory videos *(F1)*), coupled with a story-like progression and gamified elements *(F14)* through the ideation phases, enhanced the user immersion. Students noted increased productivity in idea generation and valued the linguistic capabilities as well as access to extensive data as *“effective and inspiring”*. Educators found PICO beneficial for digital team collaboration and gaining insights into students' questions addressed to the learning companion.

Contrarily to the positive indications, we observed some tensions: It is important to balance the need for didactic guidance and a certain degree of freedom enabling to *“explore the systems’ modules by ourselves”* and *“gain a better idea on conversational AI and how to use it purposefully”*. Also, while some formulated concerns about replacing human relationships, engaging and empathic interactions were highlighted as their favorite feature *(F2)*. Contrasting EP1, the students' focus in the EP2 setting was on learning BM ideation without external incentives (e.g., winning prices), so we conclude that the way of the didactical integration in class has an impact on students’ motivational drivers and use.

## Episode EP3 – Industry Project to Innovate an Existing Business Model

In addition to applying the BMDT through students, we also shed light on how a team of company employees uses the tool for innovating concrete BMs. Embedded in a three-day workshop, a group of ten employees with interdisciplinary backgrounds from an ideation department of a single industry partner used the principles of our artifact to create novel ideas concerning mobility challenges. The project goals comprise an increased inspiration and productivity of the idea generation process as well as triggers for thinking out of the box as intrapreneurs.

In EP3, we found that informal learning played a significant role, allowing participants to gain knowledge and insights alongside their daily operational responsibilities. However, due to privacy concerns, our conversational AI *(F10)* could not be utilized – data management and accessibility were key barriers. Contrarily to our observations in students’ formal learning settings, motivational and adaptable features *(F13, F14)* were barely given attention because the employees showed an intrinsic motivation to find solutions efficiently in the limited time frame given *“without being distracted by gamified elements”.* Despite rather limited tool use, the workshop succeeded in its aim to drive creative outcomes and foster a culture of innovation. Instead of an educator, there was a moderator who introduced the BMDT and the participants demonstrated a high self-efficacy in coming up with creative ideas facilitated by the tool; potentially due to their work experience and proficiency in finding solutions to a given problem. Employees attested a hedonic value as it *“was fun to experiment again like a child, just with business model patterns instead of toy blocks”*. Compared to the students, who came up with many creative BM ideation ideas, the employees focused on only two ideas to be specified in detail considering feasibility as well after just 20 minutes. They spent more time collaborating with the entire group in a physical setting using flipcharts to visualize their ideas from the digital tool with the pattern card library *(F8)* as the most extensively used feature. Although learning has never been a priority in the workshop, participants attested that they had learned a lot as they now *“better understand BMs and how to ideate them”.*

## Observations and Reflections

As generalizability is a major concern in DSR (Baskerville et al. 2018), we sought to reflect on the observations from building and evaluating our artifact to inform future endeavors. Continuous reflection supports us in moving from building a specific instance to more abstract insights applicable to a class of problems and solutions (Schoormann, Möller, and Chandra Kruse 2023; Sein et al. 2011). In the following, we synthesize the observations that occurred in our research process and formulate recommendations along with two categories for designing educational BMDTs and implementing these in educational settings (see Figure 4). The abstracted design knowledge is mapped to the underpinning layers (i.e., social, motivational, educational) following Benner et al. (2022).

| | Observations | Guidelines |
|---|---|---|
| **Designing Educational BMDTs** | Students appreciate social interactions (e.g., chat, PICO personification), highlighting the significance of social connection for engagement and motivation (EP1-2).<br>Even in a competitive environment they prefer social aspects but are less open to sharing their ideas (EP1). | **Social bonding:** Establish social bonding with students through anthropomorphic features in an educational BMDT to create an interactive, socially engaging learning experience *(social layer)*. |
| | Students desire a tool that proactively offers adaptable features that foster engagement, indicating the need for customization to align with different motivational drivers (EP1-2).<br>Motivational drivers to use BMDT varied heavily between the contexts and target users (see EP1-3 in comparison). | **Personalization:** Incorporate adaptable features and a modular user interface to cater to the diverse (individual) needs and usage drivers of the target audience *(motivational layer)*. |
| | Students positively highlighted the multi-phase process, explanatory videos, and the successive addressing of learning objectives (EP2).<br>Informal learning even takes place when the tool is applied in a business setting (EP3). | **Guidance:** Provide built-in didactic guidance and make sure the lecturer/moderator communicates the BMDT's functionality and learning opportunity in the respective context *(educational layer)*. |
| **Implementing BMDTs in Educational Settings** | External lecturers were initially scared of lacking the skills to introduce and apply the tool appropriately (EP1).<br>Privacy concerns limited the use of certain features (particularly conversational AI), emphasizing the importance of data protection and accessibility (EP3). | **Tool adaption:** Minimize barriers to (initial) tool usage (e.g., provide technical and didactical onboarding, ease accessibility and transparent data management) to facilitate IT adoption. |
| | When the tool was only briefly introduced by lecturers (EP1), students reported lacking clarity and less effective one-time usage.<br>Students got excited about conversational AI and learned with the tool, while also improving digital literacy (EP2).<br>Employees appreciated the opportunity to innovate and learned 'on the fly' about BM ideation, while they would not have signed up for a formally announced learning unit (EP3). | **Mindful didactics:** Integrate the tool as a mandatory didactic course element for students, such as by introducing conversational AI, delivering detailed tool presentations, and providing clear instructions on usage to then reflect upon.<br>**Informal learning:** Reflect on informal learnings (especially at the end of more business-oriented application scenarios). |
| | Students did not anticipate the BMDT's Value-in-Use before its usage and needed initial guidance (EP1-2).<br>The tools' perceived value depends on the student, setting and its purpose; thus recommended features and usage duration need to be aligned (e.g., in a competition vs. a pure learning environment, EP1-3). | **Value-in-Use:** Communicate the expected ViU from the lecturer's or moderator's perspective, and solicit users' expectations in advance. Then highlight selected features and guide users to apply modules effectively. |

Figure 4. Formalized Reflections

# VI. DISCUSSION

The overall purpose of our research is to produce design knowledge for the class of educational tools that guide BM ideation. Training abilities for creating novel ideas are important for students and entrepreneurs beyond disciplinary boundaries to face today's challenges for continuous innovation and the adaptation of organizations. By making use of justificatory knowledge from pattern-based innovation, thinking styles, and motivation theory to consider individual learning preferences and drivers, this paper iteratively designed PICO, an artifact in the form of an educational BMDT, and generalized insights from both the building and evaluation activities in various application contexts with the intention to make participants learn about BM ideation.

From a **research** viewpoint, *(1)* our web-based educational BMDT (i.e., situational artifact) and the more abstract knowledge (i.e., design requirements, features, and generalized guidelines) respond to recent calls for tooling in the realm of BM innovation (e.g., Bouwman et al. 2020). Our tool especially considers the educational domain and thus implements features, including teaching a basic understanding of BMs, navigating through different ideation stages, as well as motivating the use through gamification elements to increase engagement and respect individual learning styles. Moreover, *(2)* since existing tools tend to focus on advanced stages of innovation, our work contributes to the early stages in particular. The ideation phase itself consists of numerous activities, such as developing, refining, and validating ideas, that need to be performed systematically (Hoveskog et al. 2015). Herewith in line, we *(3)* provide design features relevant to a specific context and advance the current body of BMDT features. For instance, features to enable the use of pre-defined templates/patterns and generative AI, as well as being oriented via phase management are seldom provided by such tools (Szopinski et al. 2020).

From an **educational practice** perspective, our work *(4)* responds to entrepreneurial needs in terms of skills to jointly spot opportunities and create solutions (Hameed and Irfan 2019; Lindner 2018) via a structured ideation process. As learners are confronted with crafting and selecting their own ideas, we aim to *(5)* train advanced skills for applying, analyzing, evaluating, and creating outcomes that go beyond pure understanding through factual knowledge transfer (see Bloom's Taxonomy (1956)). In this course, *(6)* our paper reports on a web-application and thus adds an important component to online formats of entrepreneurship education that face only limited adoption (Liguori and Winkler 2020). Its instantiation goes beyond a conceptual prototype, as the tool is already being used in real-world entrepreneurship courses and has even proven to facilitate informal learning in a business context. For that reason, *(7)* we condensed our experiences and observations into guidelines for the BMDT's implementation to facilitate its adoption in further (educational) settings.

In line with Townsend and Hunt (2019), we view creativity as a cornerstone skill, essential not only throughout the general ideation process in entrepreneurship but also in effectively navigating the integrated conversational AI within our instantiated BMDT named 'PICO'. This dynamic co-creation of BMs demands students' adeptness at critically evaluating outcomes and meticulously considering their pragmatic application within diverse contexts. To facilitate the attainment of the highest echelons of Bloom's (1956) Taxonomy within the classroom, our paper stresses the indispensable role of educators in orchestrating a purpose-driven pedagogical trajectory that becomes pivotal for the seamless integration of educational BMDTs into the instructional framework. Beyond the realms of Entrepreneurship Education, this underscores the broader need to harness innovative technologies and reevaluate the competencies that students must be equipped with for their future vocations (Bell and Bell 2023). While our artifact is tailored for BM ideation in entrepreneurial education, its implications extend to various contexts and students with diverse disciplinary backgrounds. For example, computer science courses can employ coding patterns, and IS courses can build design patterns, thus demonstrating how to spur innovation with PICO across domains. Additionally, PICO's embedded interactions with conversational AI impart students with valuable experiential skills, promoting creativity, irrespective of their field of study. Thus, the tool fosters interdisciplinary interest in education empowered by IS.

Despite the promising indications gleaned from our ex-post evaluations, wherein students and practitioners demonstrated prowess in generating innovative ideas, it is important to acknowledge the limitations of our results in terms of representativeness. These findings can be further elucidated contingent on the characteristics of the target audience, the specific learning milieu, and additional factors such as cultural nuances or the legal landscape pertaining to its application (Mehta et al. 2021). Moving forward, we intend to investigate PICO's impact on student's learning outcomes and creativity, encompassing the quantitative and qualitative aspects of the generated skills in ideating BM concepts. We conclude that discourse on how to design and adopt innovative BMDTs context-specifically to reshape education is urgently needed (Bell and Bell 2023).

## References

Baskerville, Richard, Abayomi Baiyere, Shirley Gregor, Alan Hevner, and Matti Rossi. 2018. "Design Science Research Contributions: Finding a Balance between Artifact and Theory." *Journal of the Association for Information Systems* 19(5).

Bell, Robin, and Heather Bell. 2023. "Entrepreneurship Education in the Era of Generative Artificial Intelligence." *Entrepreneurship Education*.

Benbasat, Izak, Angelika Dimoka, Paul A. Pavlou, and Lingyun Qiu. 2010. "Incorporating Social Presence in the Design of the Anthropomorphic Interface of Recommendation Agents: Insights from an FMRI Study." *Human Computer Interaction*.

Benner, Dennis, Sofia Schöbel, Christoph Suess, Vera Baechle, and Andreas Janson. 2022. "Level-Up Your Learning -Introducing a Framework for Gamified Educational Conversational Agents." *in Proceedings of the International Conference on Wirtschaftsinformatik (WI).*

Berehil, M. 2022. "Boosting Students Motivation Through Gamified Hybrid Learning Environments Bleurabbit Case Study." *Smart Innovation, Systems and Technologies* 237:561–76. Björk, Jennie. 2012. "Knowledge Domain Spanners in Ideation." *Creativity and Innovation Management* 21(1):17–27.

Bloom, Benjamin S. 1956. *Taxonomy of Educational Objectives: The Classification of Educational Goals*. New York: David McKay.

Bouwman, Harry, Mark de Reuver, Marikka Heikkilä, and Erwin Fielt. 2020. "Business Model Tooling: Where Research and Practice Meet." *Electronic Markets* 30(3):413–19.

Bruns, Katherina, and Frank Jacob. 2016. "Value-in-Use: Antecedents, Dimensions, and Consequences." *Marketing ZFP* 38:135–49.

Clark, Herbert H., and Susan E. Brennan. 1991. "Grounding in Communication." Pp. 127–49 in *Perspectives on Socially Shared Cognition*. Washington, DC, US: American Psychological Association.

Davis, Fred D. 1993. "User Acceptance of Information Technology: System Characteristics, User Perceptions and Behavioral Impacts." *International Journal of Man-Machine Studies* 38(3):475–87.

Dellermann, Dominik, Nikolaus Lipusch, Philipp Ebel, and Jan Marco Leimeister. 2019. "Design Principles for a Hybrid Intelligence Decision Support System for Business Model Validation." *Electronic Markets* 29(3):423–41.

Ebel, Philipp, Ulrich Bretschneider, and Jan Marco Leimeister. 2016. "Leveraging Virtual Business Model Innovation: A Framework for Designing Business Model Development Tools: Leveraging Virtual Business Model Innovation." *Information Systems Journal* 26(5):519–50.

Elshan, Edona, and Philipp Ebel. 2020. "Let's Team Up: Designing Conversational Agents as Teammates." in *Proceedings of the International Conference on Information Systems (ICIS)*. Hyderabad, India.

Frankenberger, Karolin, Tobias Weiblen, Michaela Csik, and Oliver Gassmann. 2013. “The 4I-Framework of Business Model Innovation: A Structured View on Process Phases and Challenges.” *International Journal of Product Development* 18(3–4):249–73.

Gassmann, Oliver, Michaela Csik, and Karolin Frankenberger. 2014. *The Business Model Navigator: 55 Models That Will Revolutionise Your Business*. 1st ed. Harlow, England; New York: FT Press.

Geiger, Manuel, Susanne Robra-Bissantz, and Michael Meyer. 2020. “Focus on Interaction: Applying Service-Centric Theories in IS.” In *Proceedings of the eBled Conference*. Bled.

Hameed, Irfan, and Zainab Irfan. 2019. “Entrepreneurship Education: A Review of Challenges, Characteristics and Opportunities.” *Entrepreneurship Education* 2(3):135–48.

Hoveskog, M., F. Halila, and M. Danilovic. 2015. “Early Phases of Business Model Innovation: An Ideation Experience Workshop in the Classroom.” *Decision Sciences Journal of Innovative Education* 13(2):177–95.

Khosrawi-Rad, Bijan, Ricarda Schlimbach, Timo Strohmann, and Susanne Robra-Bissantz. 2022. “Design Knowledge for Virtual Learning Companions.” in *Proceedings on the International Conference on Information Systems Education and Research*. Copenhagen, Denmark.

Krathwohl, David R. 2002. “A Revision of Bloom’s Taxonomy: An Overview.” *Theory Into Practice* 41(4):212–18.

Kuechler, Bill, and Vijay Vaishnavi. 2008. “On Theory Development in Design Science Research: Anatomy of a Research Project.” *European Journal of Information Systems* 17(5):489–504.

Lester, James C., Sharolyn A. Converse, Susan E. Kahler, S. Todd Barlow, Brian A. Stone, and Ravinder S. Bhogal. 1997. “The Persona Effect: Affective Impact of Animated Pedagogical Agents.” Pp. 359–66 in *Proceedings of the ACM SIGCHI Conference on Human factors in computing systems*, *CHI ’97*. New York, NY, USA: Association for Computing Machinery.

Liguori, Eric, and Christoph Winkler. 2020. “From Offline to Online: Challenges and Opportunities for Entrepreneurship Education Following the COVID-19 Pandemic.” *Entrepreneurship Education and Pedagogy, 3(4)*, 346-351.

Lindner, Johannes. 2018. “Entrepreneurship Education.” in *Handbuch Entrepreneurship*, *Springer Reference Wirtschaft*, edited by G. Faltin. Wiesbaden: Springer Fachmedien.

Lowenthal, P. R. 2009. “The Evolution and Influence of Social Presence Theory on Online Learning.” Pp. 124–39 in *Online Education and Adult Learning: New Frontiers for Teaching Practices*, *Advances in Educational Technologies and Instructional Design*, edited by T. T. Kidd. Hershey, PA: IGI Global.

Mehta, Nikhil, Sumedha Chauhan, Parul Gupta, and Mahadeo Jaiswal. 2021. “Pursuing Digital Learning Platform Success: A Meta-Analytic Investigation of User and Cultural Contingencies.” *Communications of the Association for Information Systems* 48(1).

Müller-Wienbergen, Felix, Oliver Müller, Stefan Seidel, and Jörg Becker. 2011. “Leaving the Beaten Tracks in Creative Work – A Design Theory for Systems That Support Convergent and Divergent Thinking.” *Journal of the Association for Information Systems* 12(11).

Nambisan, Satish. 2017. “Digital Entrepreneurship: Toward a Digital Technology Perspective of Entrepreneurship.” *Entrepreneurship Theory and Practice* 41(6):1029–55.

Nass, Clifford, Jonathan Steuer, and Ellen R. Tauber. 1994. “Computers Are Social Actors.” in *Proceedings of the SIGCHI conference on Human factors in computing systems*. ACM.

Ogutveren-Gonul, Ozlem. 2019. “Teaching and Implementing Ideation in Entrepreneurship: A Systematic Approach.” *Journal of Entrepreneurship and Business Innovation* 5(2):27–45.

Osterwalder, Alexander, and Yves Pigneur. 2013. “Designing Business Models and Similar Strategic Objects: The Contribution of IS.” *Journal of the Association for Information Systems* 14(5).

Plass, Jan L., and Shashank Pawar. 2020. “Toward a Taxonomy of Adaptivity for Learning.” *Journal of Research on Technology in Education* 52(3):275–300.

Recker, Jan, and Frederik von Briel. 2019. “The Future of Digital Entrepreneurship Research: Existing and Emerging Opportunities.” in *Proceedings of the International Conference on Information Systems (ICIS)*. Munich, Germany.

Ryan, Richard M., and Edward L. Deci. 2000. “Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being.” *American Psychologist* 55(1):68–78.

Schlimbach, Ricarda, Jannika Behne, Tim Lange, and Susanne Robra-Bissantz. 2023. “Using Hexad Archetypes to Motivate Students in a Chatbot-enhanced Web-based-Training.” in *Proceedings of the International Conference on Wirtschaftsinformatik (WI)*, Paderborn, Germany.

Schlimbach, Ricarda, Sören Christmann, and Susanne Robra-Bissantz. 2022. “Designing a Java Application for pattern-based Business Model Adaptation.” *in Proceedings of the Americas Conference on Information Systems (AMCIS)*. Minneapolis, MN (USA).

Schlimbach, Ricarda, and Susanne Robra-Bissantz. 2022. “Adapt or Die! - A Board Game to Support Dynamic Business Model Creation in Digital Darwinism.” In *Proceedings of the International Conference on* Wirtschaftsinformatik (WI), Nürnberg, Germany.

Schlimbach, Ricarda, Charlotte Windolf, and Susanne Robra-Bissantz. 2023. “A Service Perspective on Designing Learning Companions as Bonding and Mindful Time Managers in Further Education.” in *Proceedings of the European Conference on Information Systems (ECIS)*. Kristiansand, Norway.

Schneider, Sabrina, and Patrick Spieth. 2013. “Business Model Innovation: Towards an Integrated Future Research Agenda.” *International Journal of Innovation Management* 17(01):1340001.

Schoormann, Thorsten, Frederik Möller, and Leona Chandra Kruse. 2023. “The Beauty of Messiness: A Flexible Tool for Design Principle Projects.” in *Proceedings of the Hawaii International Conference on System Sciences (HICSS)*. Hawaii, USA.

Schoormann, Thorsten, Maren Stadtländer, and Ralf Knackstedt. 2021. “Designing Business Model Development Tools for Sustainability— A Design Science Study.” *Electronic Markets*. 32.

Sein, Henfridsson, Purao, Rossi, and Lindgren. 2011. “Action Design Research.” *MIS Quarterly* 35(1):37.

Shapiro, Susan P. 2005. “Agency Theory.” *Annual Review of Sociology* 31(1):263–84.

Short, John, Ederyn Williams, and Bruce Christie. 1976. *The Social Psychology of Telecommunications*. London; New York: Wiley.

Someren, Maarten, Yvonne Barnard, and Jacobijn Sandberg. 1994. *The Think Aloud Method - A Practical Guide to Modelling Cognitive Processes*.

Steinherr, Vanessa Maria, and Ramona Reinelt. 2022. “Using Hexad User Types to Identify Motivational Preferences among Learners.”

Szopinski, Daniel, Thorsten Schoormann, Thomas John, Ralf Knackstedt, and Dennis Kundisch. 2020. “Software Tools for Business Model Innovation: Current State and Future Challenges.” *Electronic Markets* 30(3):469–94.

Tolzin, Antonia, Anita Körner, Ernestine Dickhaut, Andreas Janson, Ralf Rummer, and Jan Marco Leimeister. 2023. “Designing Pedagogical Conversational Agents for Achieving Common Ground.” Pp. 345–59 in *Design Science Research for a New Society: Society 5.0*, *Lecture Notes in Computer Science*, edited by A. Gerber and R. Baskerville. Cham: Springer Nature Switzerland.

Tondello, Gustavo F., Rina R. Wehbe, Lisa Diamond, Marc Busch, Andrzej Marczewski, and Lennart E. Nacke. 2016. “The Gamification User Types Hexad Scale.” *in Proceedings of the 2016 Annual Symposium on Computer-Human Interaction in Play*, 229–43.

Townsend, David M., and Richard A. Hunt. 2019. “Entrepreneurial Action, Creativity, & Judgment in the Age of Artificial Intelligence.” *Journal of Business Venturing Insights* 11:e00126.

Veit, Daniel, Eric Clemons, Alexander Benlian, Peter Buxmann, Thomas Hess, Dennis Kundisch, Jan Marco Leimeister, Peter Loos, and Martin Spann. 2014. “Business Models: An Information Systems Research Agenda.” *Business & Information Systems Engineering* 6(1):45–53.

Venable, John, Jan Pries-Heje, and Richard Baskerville. 2016. “FEDS: A Framework for Evaluation in Design Science Research.” *European Journal of Information Systems* 25(1):77–89.

Voigt, Matthias, Ralf Plattfaut, Kevin Ortbach, Andrea Malsbender, Björn Niehaves, and Jörg Becker. 2013. “Evaluating Business Modeling Tools from a Creativity Support System Perspective-Results from a Focus Group in the Software Development Industry.” in *Proceedings of the Pacific Asian Conference on Information Systems (PACIS)*. Jeju Island, Korea.

## ABOUT THE AUTHORS

**Ricarda Schlimbach** is a teaching professor for Business Information Systems at Heilbronn University funded by the Gerhard and Ilse Schick Foundation. She has coordinated the research project ‘StudyBuddy’ for the development of AI-based Learning Companions to facilitate learning in higher education at TU Braunschweig. Ricarda has been working for 10 years in the Automotive industry and is passionate about bridging research and practice by teaching courses such as Digital Business Management.

**Tim Lange** is a PhD Student in Business Information Systems and supported the PICO project during his master studies at TU Braunschweig by deriving design knowledge and supporting the BMDT’s development in software engineering. He brings in practical experience from various roles in business consulting.

**Felix Wagner** is a master student in Computer Science at TU Braunschweig and supported the PICO project during his (undergraduate) studies at TU Braunschweig. He has developed the web application (backend and frontend).

**Susanne Robra-Bissantz** has been head of the Institute for Business Information Systems and the Chair for Service Information Systems at TU Braunschweig since 2007. She actively works on new forms of teaching like GamEducation or Flipped Classroom concepts and has implemented numerous third-party-funded projects in cooperation with industry. Her work on eServices, Collaboration Technology, eLearning, and context-aware Information Systems has been published in international conferences and recognized journals.

**Thorsten Schoormann** is a postdoctoral researcher at the University of Hildesheim. Thorsten’s research focuses on business model innovation, design science research, and (digital) tools that foster economic, ecological, and social sustainability. His work has been published in numerous recognized academic journals and he is passionate about teaching in IS.