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ABSTRACT

In the past decade, digital B2B platforms have gained significant importance as they differ in value creation and capture compared to traditional linear business processes. Previous research developed the SPEC – Smart Platform Experiment Cycle, a process to validate digital platforms to ensure their success. It is important to investigate if and how step (1) of SPEC can be expanded by other platform design tools. This study developed a new Live-Lab called KaPIL – Karlsruher Platform Innovation Lab, to design digital platforms and test related tools and methods. Applying the Design Research Methodology, the designed Live-Lab is created by implementing ProVIL – Product Development in a Virtual Idea Laboratory combined with the Smart Education Concept and digital platform knowledge. KaPIL was applied with students from the Karlsruhe University of Applied Sciences in cooperation with the company STIHL to assess its efficacy, applicability, and validity. KaPIL can be used to design digital platforms and shows that the Platform Canvas, the Platform Business Model Canvas, and the Platform Design Canvas can expand step (1) of SPEC. In future research, more applications of KaPIL are required to validate its robustness and extend it to other digital platform methods and tools.

Keywords: *digital platform, live-lab, design research methodology, innovation process, validation environment*

Introduction

Over the last years, it has become visible that digital platforms tend to dominate markets. Today, the world's most valuable brands, such as Google, Amazon, Microsoft and Apple, are based on digital platform business models. In contrast to many traditional pipeline companies, whose brand value has declined in the wake of the COVID-19 pandemic, digital platforms are recording positive, double-digit growth rates in their brand value (Interbrand 2021; Schmidt 2021). Also, it can be observed that platforms such as Alibaba, Facebook or Airbnb have often been founded in Asia and United States of America while European economies are lagging in the creation of platform businesses (Hosseini and Schmidt 2022).

One way of gaining a foothold in the platform economy might be to transform existing pipeline business models of technology- and knowledge-based companies into platform business models. This is a trend that seems to be ongoing at the moment, as a recent study by the Federation of German Industries revealed that many companies in the business-to-business (B2B) market are trying to transform their business model (Bundesverband der Deutschen Industrie e.V 2021). That focus on B2B business models might allow European companies to enter the platform business model realm competitively by using their expertise from their market segment to create new and powerful digital platforms. Furthermore, research on this topic has shown that platforms often fail before they gain significant relevance (Yoffie et al. 2019). This also shows that a systematic approach to designing platforms could help practitioners in that process.

This paper can be seen as a response to (Brecht et al. 2021b) who deal with the validation of digital platforms in their work. For this purpose, the authors designed the SPEC – Smart Platform Experiment Cycle. It requires practitioners to already have an existing platform business model mapped out which is validated or refuted through smart experiment design and execution. To make the process more accessible to persons who do not yet meet that requirement, the authors requested research in how practitioners can get to the state of meeting that requirement with a rapid platform exploration method called SPDS (Brecht et al. 2021a).

The authors have highlighted the relevance of B2B platform business model creation. But how can the creation of those digital platforms be fostered systematically? As a starting point of research, the authors assume that a streamlined process to ideate and design digital platforms as well as a suitable choice of tools and methods should be considered. With this paper, the authors aimed to develop and test a Live-Lab that fosters the creation of platform business model as well as verify which of the available tools are best suited for the platform design. A Live-Lab is a research method that enables researchers to test methods and processes in a realistic setting while controlling important conditions (Walter et al. 2016). Therefore, this paper answers the following research questions:

> RQI: If and how step (1) of the Smart Platform Experiment Cycle (SPEC) can be expanded by other Platform Design Tools?

RQ II: How can a Live-Lab be designed and executed with the objective to design digital platforms and test digital platform tools and methods?

The answers to these research questions were found by analyzing the Live-Lab ProVIL and the Smart Education Concept to design a validation environment. Based on the findings, KaPIL was designed and demonstrated it with the company challenges of STIHL to design digital platforms. This paper is structured as follows. The first section shows relevant digital platform methods and tools as well as the structure of the Live-Lab ProVIL and the Smart Education Concept. The next section elaborates the Design Research Methodology (DRM) and the dimensions, variables, and evaluation metrics of the quantitative interviews. Next section "Results" shows how the requirements of a Live-Lab were applied in KaPIL and proved how the platform tools and methods fulfil its purpose as a designing tool for digital platforms. Finally, this research concludes with a discussion and future implications for researchers and practitioners dealing with designing digital platforms.

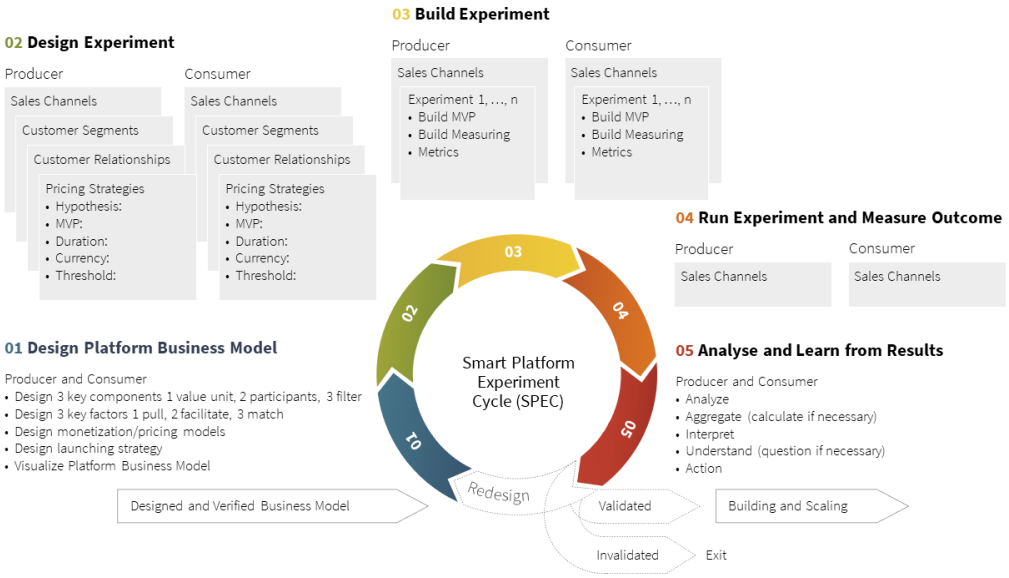
Literature Review

SPDS – Smart Platform Experiment Cycle

The SPEC – Smart Platform Experiment Cycle is a validation process specifically for digital platforms tested in the Business-to-Consumer (B2C) sector (Brecht et al. 2021b). It is an aggregated process based on the build-measure-learn feedback loop of the Lean Startup approach (Ries 2011), the Customer Development Process (Blank and Dorf 2012), the Four-step Iterative Cycle (Thomke 2003), and the core principles of platform design (Parker et al. 2016). The SPEC is divided into five steps, which are illustrated in Figure 1.

The starting point for applying SPEC is an already verified business model. The first step consists of designing a platform business model. Here, the participants, functions, strategies for monetization, and the platform introduction should be defined and visualized. In the second step, experiments must be designed for the individual components of the platform business model to validate hypotheses from the previous step. When designing the experiments, the order in which the building blocks are validated is determined and scheduled. In the context of digital platform business models, the designed experiments validate the user side of the platform, the sales channels, customer relationships, and pricing strategies. In step three, a Minimal Viable Product (MVP) is built, for instance as a landing page. The MVP represents a first solution to the customer's problem and should contain the most essential functions. Next, the experiments are conducted in the specified order and results are measured. Observations on the specified measurement metric are collected. In the final step, the observations are analyzed, and lessons learned from the results. After this final step and depending on the results, the SPEC can be exited. It leads to building and scaling of the platform or discarding the business model entirely. Alternatively, the SPEC can be cycled through again to gain more insights on digital platforms.

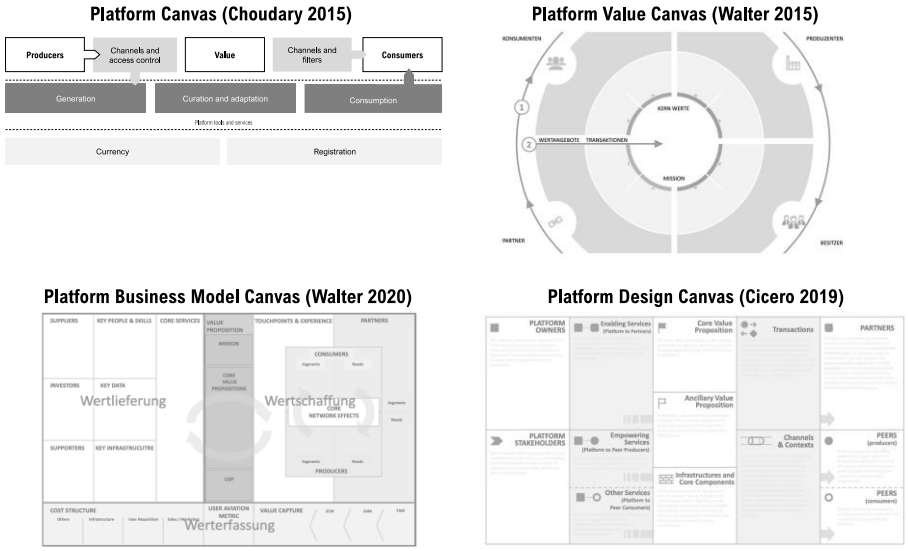
Figure 1. *SPEC – Smart Platform Experiment Cycle (Brecht et al. 2021b)*



Platform Design Tools

The following section presents platform design tools: (1) Platform Canvas by (Choudary 2015), which is part of the holistic toolset. (2) Platform Value Canvas and (3) Platform Business Model Canvas, which are part of the Platform Innovation Kit by (Walter 2015, 2020) and (4) Platform Design Canvas from (Cicero 2019), which is part of the Platform Design Toolkit (Cicero 2019). These four canvases were selected to be tested in KaPIL as suggested by (Brecht et al. 2021b) to initially design digital platforms with SPEC. In 2021 there was an update of the Platform Design Toolkit and Platform Innovation Kit. This research was done by the tools before the updated versions of 2021.

Figure 2. *Digital Platform Tools based on (Choudary 2015; Cicero 2019; Walter 2015, 2020)*



Platform Canvas (PC)

Choudary's Platform Canvas visualizes the most relevant components of a digital platform, divided into ten building blocks. Accordingly, the three decisive activities are defining a value-creating interaction, constructing an infrastructure to realize this interaction, and mapping the strategies for value capture (Choudary 2015). Platform design with the Platform Canvas works as follows: Building blocks are used to represent the core interaction. The platform building block describes an infrastructure for value exchange between participants. Next, the role and the motivation of the two participants, producer and consumer, are defined. The fourth step is to identify the offered value, which is exchanged via the platform. The next step is to use channels to enable participant access to the platform, for example, via a website or app. The platform controls producer access, so only producers with desirable behavior create content. While filters ensure the relevance of the content displayed to consumers, the platform should provide producers special developer tools to facilitate the creation of value units. Once interaction and access mechanisms are determined, the infrastructure is built by defining tools, services, and the platform activities. Tools and services are, for example, recommendation services and efficient search functions. In addition, the content should be curated and the display adapted to the needs of the individual user. Furthermore, a monetary or non-monetary currency must be defined that is used in the value exchange. Lastly, mechanisms for value capture must be described concerning monetization strategies or pricing models (Choudary 2015).

Platform Value Canvas (PVC)

The Platform Value Canvas (PVC) is part of the Platform Innovation Kit by Matthias Walter and Simon Torrance. The toolkit encompasses a collection of seventeen canvases and tools. The Platform Value Canvas is a methodical approach to visualize a platform business model (Walter 2020). The canvas focuses on the platform stakeholders and the value propositions. The canvas has a circular structure and is divided into four quadrants. Producers represent the supply side and create and offer the value units via the platform. In contrast, consumers are the demanding entity who want to use the value units. The owner owns the platform, provides the infrastructure, and defines all essential components of the business model. The fourth stakeholder group represents partners such as suppliers and business partners who determine the successful implementation of the platform. The stakeholder group names at least one positive value proposition the platform delivers from their viewpoint. The next step is to define value-generating transactions. At the center of the canvas, key components such as filters, algorithms, curation tools, the main functions, and the mission of the business model are described (Walter 2020).

Platform Business Model Canvas (PBMC)

The Platform Business Model Canvas (PBMC) corresponds to a one-page dashboard to map all essential building blocks of a platform business model. In addition to design, it can track the progress of the validation process. The PBMC is divided into three sections and fifteen building blocks. First, on the right side of

the Canvas, six building blocks are used to define how value creation takes place in the business model. Therefore, the three external participant groups, the consumers, the producers, and the partners must be identified, and their needs recorded. Then a value proposition is created for each segment and adapted to their needs. It is divided into three components: (1) the core value unit, which is exchanged between consumers and producers, (2) the core mission of the platform, which states why the platform exists, and (3) the unique selling proposition (USP), which differentiates the value proposition from alternative product solutions. Once the external participants and their value propositions are defined, the next step is to determine the touchpoints and experiences through which the platform participants are reached and connected in the ecosystem. In addition, core network effects between producers and consumers must be identified and determined how the platform stimulates and promotes one-way and cross-side network effects (Walter 2020).

After all elements of value creation are described, the canvas continues by defining the seven elements of value delivery on the left side of the PBMC, including the platform core services that support stakeholders in onboarding, matching, and exchange. Notably, it highlights how these services differ from the competition. In addition, it must identify which people and skills (e.g., employees) are needed to build and operate the platform. Another significant element is data. Data should be analyzed and determined which data flows represent the platform core and how they should be processed. Next, the canvas builds an infrastructure and identifies which core elements are required for the platform to function. Finally, it identifies key stakeholders relevant to the creation, operation, and financing the business strategy, including key suppliers, investors, and supporters. The third area of the PBMC represents the value capture. In this area, it documents the cost structure with its essential cost drivers, which accumulate about 80 percent of the costs, all revenue sources, and value-generating units such as sales and data. The last element is the core metrics, which defines the applied metrics to measure the platform success. One criticism is that filling out the PBMC can be overwhelming due to the many details, especially at the beginning of the business model development. Therefore, it is recommended to use the PVC before the PBMC (Walter 2020).

Platform Design Canvas (PDC)

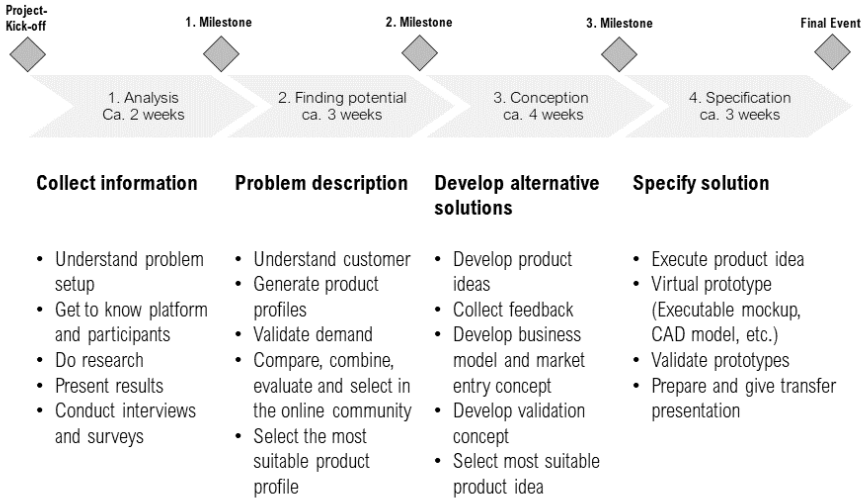
The Platform Design Canvas (PDC) is part of the Platform Design Toolkit by Simone Cicero. The toolkit contains a guide for the step-by-step creation of a platform business model. For this, eight steps and seven modeling tools are listed as aids (Cicero 2019). The canvas can be used either alone or together with the auxiliary canvases of the toolkit's 8-step guide. The structure of the PDC is like Osterwalder and Pigneur's Business Model Canvas and, like the PBMC, serves as a dashboard for quickly summarizing platform strategy and identifying platform and ecosystem potential (Cicero 2019). The PDC is divided into thirteen building blocks. The right side of the canvas depicts the platform's partners, peer producers, and peer consumers. In the middle of the Canvas, the value propositions are elaborated. (Cicero 2019) differentiates between the core value proposition and

auxiliary value propositions. The core value proposition represents the primary benefit to the peer segments and defines the problem solutions. In contrast, auxiliary value propositions represent the secondary benefit, which can relate to existing or new user groups. At the same time, the coordination and transaction costs should be minimized. For this, the next building block is to define what constitutes a good transaction and how a high volume can be promoted. Additionally, the infrastructure and core components are listed, which are controlled by the platform owner and managed via policies. The left side of the PDC lists the services and capabilities that a platform offers to partners, producers, and consumers. Lastly, other platform stakeholders and owners should be named. Cicero distinguishes two roles for platform owners: the owner role and the designer role. While owners manage the platform infrastructure, designers take responsibility for strategy design and a sustainable business model development (Cicero 2019).

The Live-Lab: ProVIL – Product Development in a Virtual Idea Laboratory

Live-Labs are a research method based on application in real-world scenarios and classified in-between the traditional methods of field studies and laboratory studies. The main advantage of this method is that participants perceive themselves as a product developer, which makes them more critical of new processes and methods while focusing on the project's success (Walter et al. 2016). Live-Lab concepts usually provide results that can be transferred more easily to the actual situation of the business partner (Walter et al. 2016). In contrast, field studies are too case-specific, and thus, generalizing the results is difficult (Walter et al. 2016). According to (Albers et al. 2018), by creating a Live-Lab focused strongly on real-world application, the research results gain external validity (Albers et al. 2018). Hence, the Live-Lab was chosen to answer the posed research question about the suitability of platform design canvases. The Live-Lab, ProVIL – Product Development in a Virtual Idea Laboratory has been used for cooperative product development in academia in cooperation with the industry at Karlsruhe Institute of Technology (KIT). ProVIL was run for the first time in 2016 for four months. 32 students worked on a task posed by the project partner Porsche AG in the Smart Mobility field. Ten *innovation coaches* who were students from the study program "Industrial Engineering and Business [Administration]" at Karlsruhe University of Applied Sciences supported the students. These innovation coaches moderated virtual meetings, evaluated the students' results, and supported students with the usage of the innovation platform (Walter et al. 2016). To this day, ProVIL run seven times.

Figure 3. *Process Model of ProVIL (Walter et al. 2016)*

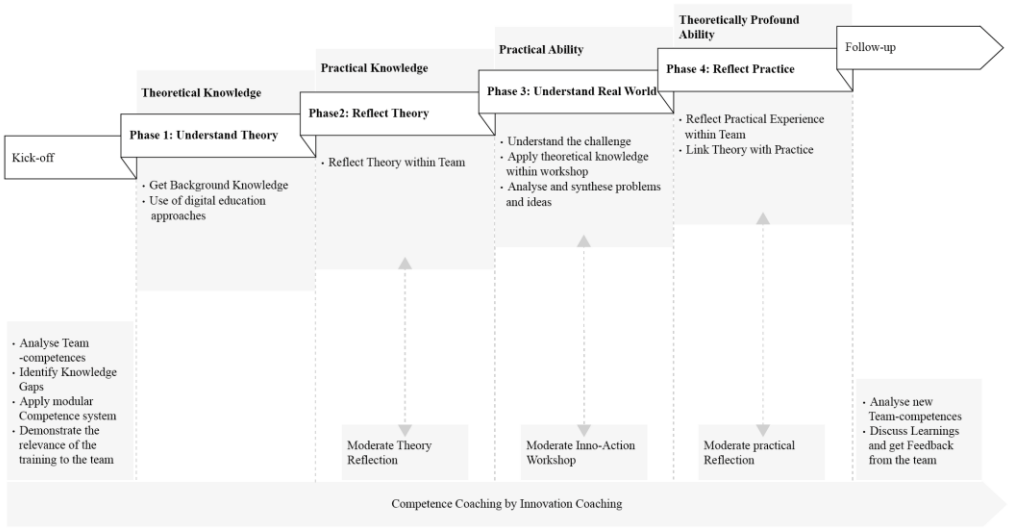


ProVIL included four steps: First, there was a planning phase. Second, a two-week research phase allowed students to get to know the topic and the innovation platform. Third, in a five-week profiling phase the goal was to gain a clear picture of the customers' needs and desires; thus, the persona-method described customers and was used to derive product profiles that matched potential solutions to the respective customers. Fourth, a three-week idea phase followed those generated ideas for the intended product development. Lastly, a three-week lasting concept phase realized first product concepts by translating the ideas into presentable mock-ups (Walter et al. 2016).

Smart Education Concept

The hybrid learning concept incorporates the three elements of theory, practice, and reflection with the goal of transferring knowledge into ability (Niever et al. 2020). During the concept application, Massive Open Online Courses (MOOCs) are used to transfer theoretical knowledge to the students. The lecturer and discussion stimulated among the students provided practical knowledge. Then, students applied the newly gained knowledge to a practical, real-life problem (Niever et al. 2020). Niever et al. 2020 suggested a four-step process when implementing a hybrid learning concept (see Figure 4). The authors emphasized the benefits of promoted and moderated learning communities and the implementation of innovation coaches (Niever et al. 2020). Furthermore, they highlight the importance of having multidisciplinary teams.

Figure 4. *Smart Education Concept Based on Hybrid Learning (Niever et al. 2020)*



Research Design

Design Research Methodology

This section describes the process of designing KaPIL with the objective of testing platform design tools in the context of a real-world problem setup. This process is based on the Design Research Methodology (DRM) by (Blessing and Chakrabarti 2009). The phases are described in the following.

Research Clarification (RC)

The objectives of the research clarification are to help researchers gain insights into the current understanding, identify the research goals, and derive a research plan (Blessing and Chakrabarti 2009). The means of this stage are literature reviews. Blessing and Chakrabarti (2009) refer to the output of each DRM stage as deliverables. Descriptions of the existing and the desired situation are modeled as networks of influencing factors in so-called reference models (Blessing and Chakrabarti 2009). Success criteria measuring the research outcome to evaluate the research need to be formulated. If it is not feasible to use those criteria in the scope of the research (e.g., if the effect happens after the research timeframe), other, *measurable success criteria* are selected to serve as indicators of these success criteria (Blessing and Chakrabarti 2009). The research plan for this paper is displayed in Figure 5. The Initial Reference Model describes the existing situation.

Descriptive Study I (DS I)

The Descriptive Study I aims at "identifying and clarifying in more detail the factors that influence the preliminary Criteria and the way in which these

factors influence the Criteria" (Blessing and Chakrabarti 2009, p. 32). It is achieved through reviewing the literature about empirical research, undertaking empirical research, and, in addition, through reasoning. In DS I, the Live-Lab, ProVIL – Product Development in a Virtual Idea Laboratory is analyzed. The Initial Reference Model from the RC phase and the preliminary Criteria are used as a basis to generate an updated Impact Model, Success and Measurable Success Criteria. Success Criteria refer to the ultimate research goal (Blessing and Chakrabarti 2009).

Figure 5. *Research Plan Based on the Design Research Methodology (Blessing und Chakrabarti 2009)*

	Descriptive Study 1	Prescriptive Study	Descriptive Study 2
	RQ 1: If and how step (1) of the SPEC – Smart Platform Experiment Cycle can be expanded by other Platform Design Tools?*		
	RQ 2: How can a Live-Lab be designed and executed with the objective to design digital platforms and test digital platform tools and methods?*		
Guiding question	What are requirements and key factors in implementing a Live-Lab to design platform business models?	How can we design and execute a Live-Lab that meets the necessary requirements?	How applicable is the derived process model and the four platform design canvases to solve real world challenges?
Methods	Literature review of the SPEC - Smart Platform Experiment Cycle	Literature review of the Live-Lab ProVIL – Product Development in a Virtual Idea Laboratory, Smart Education Concept and platform tools	Application of KaPIL process model and conducting of two surveys among KaPIL participants
Main outcomes	Reference Model derived (see section results)	KaPIL – Karlsruher Platform Innovation Lab a process model derived from ProVIL and Smart Education Concept (see section results)	Insights about conducting the Live-Lab KaPIL and the use of platform design canvases (see section results)

**Research Question*

Prescriptive Study (PS)

The Prescriptive Study aims to develop support systematically with regards to the results of DS I (Blessing and Chakrabarti 2009). The support can take on any form (e.g., guidelines, methods, or equations) and medium (e.g., paper, software, or workshops) (Blessing and Chakrabarti, 2009). It is limited in functionality but sufficiently developed to test the contribution of the research (Blessing and Chakrabarti 2009). In the case of this research, the prescriptive study develops a process model describing the design and implementation of KaPIL.

Descriptive Study II (DS II)

The objectives of the Descriptive Study II is to identify through empirical evaluation "whether the support can be used for the task for which it is intended and has the expected effect on the Key Factors" (Blessing and Chakrabarti 2009, p. 38). Criteria are the usability, applicability, and usefulness. The deliverables are success evaluation results and suggestions to improve the support, Reference and Impact Models (Blessing and Chakrabarti 2009). For this research, the Live Lab is conducted with a project partner resulting in students

participating in surveys to evaluate the application of KaPIL and its influencing factors, such as the design canvas choices.

Empirical Method

Quantitative interviews are conducted with digital platform developers to investigate the suitability of the four canvases for platform design as part of the DS II. The research question is operationalized by deriving dimensions, variables, and evaluation metrics regarding each dimension. The first survey contained 30 questions, and the second 20 questions. Table 1 outlines the dimensions and variables of the two questionnaires. The reason for conducting two surveys is twofold. Firstly, initial findings can be derived from the first survey and integrated into the next. Secondly, a second survey is necessary at a later time to gain insights into the actual use and deployment of the tools. Another advantage is that the repeated investigation of the same characteristics with the same participants increases the representativeness of the results. This approach is a panel or longitudinal study (Goldstein et al. 2018).

The first dimension contains closed questions about the study participants' prior knowledge and usage behavior. As test variables, two fictitious tools are inserted as response options in the first two questions, ensuring the evaluation of only unbiased answered questionnaires. The second category analyzes individual preferences and ratings. The first survey assesses the learnability and evaluates according to the use purpose. In the second survey, an investigation of the reasons takes place. The third dimension examines the participation, use, and collaboration with the modeling tools in the context of the challenge. Fourth, the limitations of the design tools are surveyed exploratively through the variables of boundaries and specifics in the B2B environment. The last dimension contains demographic, for instance, the subjects' age, gender, and degree program. In the follow-up, it is necessary to assess the external validity of the results.

Table 1. *Dimensions, Variables, and Evaluation Metrics of the Quantitative Interviews*

Dimension	Variables	Question type	Scale	Evaluation	Survey 1	Survey 2
Knowledge & application	Knowledge	Multiple selection	Nominal	Frequency	X	X
	Frequency of use	Multiple selection	Nominal	Frequency	X	X
	Frequency of intensity	Scale (labeled)	Ordinal	Mean	X	X
	Time of application	Multiple selection	Nominal	Frequency	X	X
	Application context	Multiple selection	Nominal	Frequency	X	
Individual preference & evaluation	Favorite	Single selection	Nominal	Frequency	X	X
	Reasons for Favorite	Open question	Nominal	Text analysis		X
	Easy to use	Single selection	Nominal	Frequency	X	X
	Easy to understand	Single selection	Nominal	Frequency	X	X
	Ability to learn	Input number	Metric	Mean	X	
	Evaluation	Scale (labeled)	Ordinal	Mean	X	
Challenge	Challenge-participation	Single selection	Nominal	Frequency	X	X
	Selection Canvas in challenge	Multiple selection	Nominal	Frequency	X	X
	Selection Canvas regarding to challange	Open question	Nominal	Text analysis		X
	Rating teamwork	Scale (labeled)	Ordinal	Mean	X	X
Limitation & critic	Limitation	Open question	Nominal	Text analysis	X	X
	B2B Specifications	Open question	Nominal	Text analysis	X	X
	Tools (Platform Design Toolkit)	Multiple selection	Nominal	Frequency	X	
	Tools (Platform Platform Innovation Kit)	Multiple selection	Nominal	Frequency	X	
Demographics	Course	Single selection	Nominal	Frequency	X	X
	Age	Single selection	Nominal	Frequency	X	X
	Gender	Single selection	Nominal	Frequency	X	X

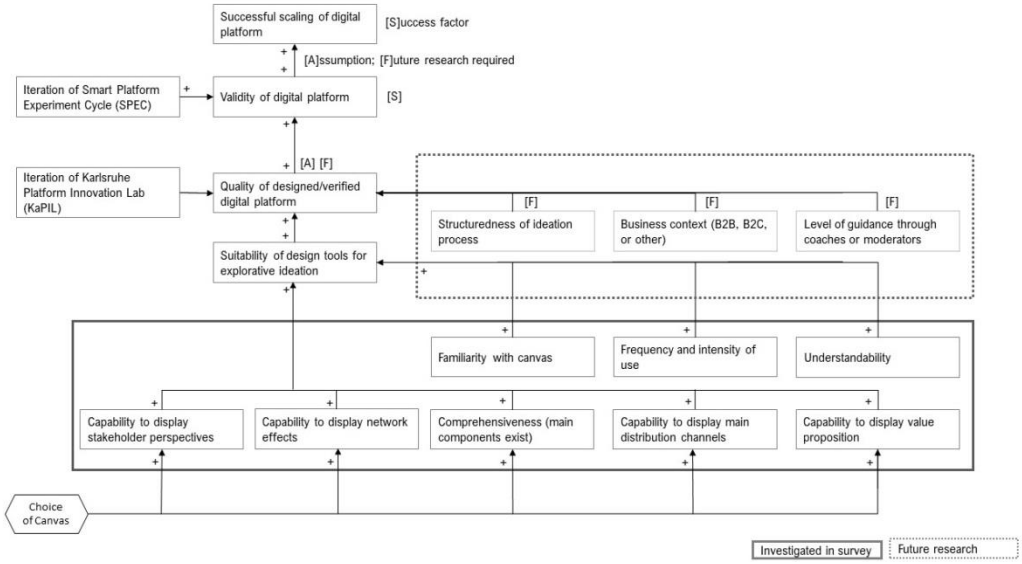
The sample of the surveys consists of 22 students from the master's programs in International Management, Industrial Engineering, and Technology Entrepreneurship at the Karlsruhe University of Applied Sciences. The participants are between 20 and 29 years old. Since students participating in KaPIL are taught in platform business model design and are familiar with the four platform design tools presented in the theoretical part of this paper, they are suitable survey participants. Data analysis is done manually using statistical metrics. Nominal variables are evaluated using relative frequencies. The arithmetic means are calculated for metric variables and preference values with an ordinal scale. A quantitative content analysis evaluates the exploratory questions containing open-ended answers. This method assigns responses with the same text parts to a common category and evaluates the frequencies (Döring et al. 2016)

Results

Live Lab – Requirements, Challenges, and Potentials

The Reference Model is mainly based on research by (Brecht et al. 2021b) and assumptions about the possible factors impacting the quality of designed business models (see Figure 6). It describes how key factors can influence other components towards scaling a platform. The research started with (Brecht et al. 2021b) regarding the Smart Platform Experiment Cycle (SPEC), a process applied to validate a platform business model. Here, research can address how practitioners can evolve from a validated business model to a successfully scaled digital platform or how one gets a verified business model to enter the SPEC.

Figure 6. *Updated Reference Model Including Success and Measurable Success Criteria*



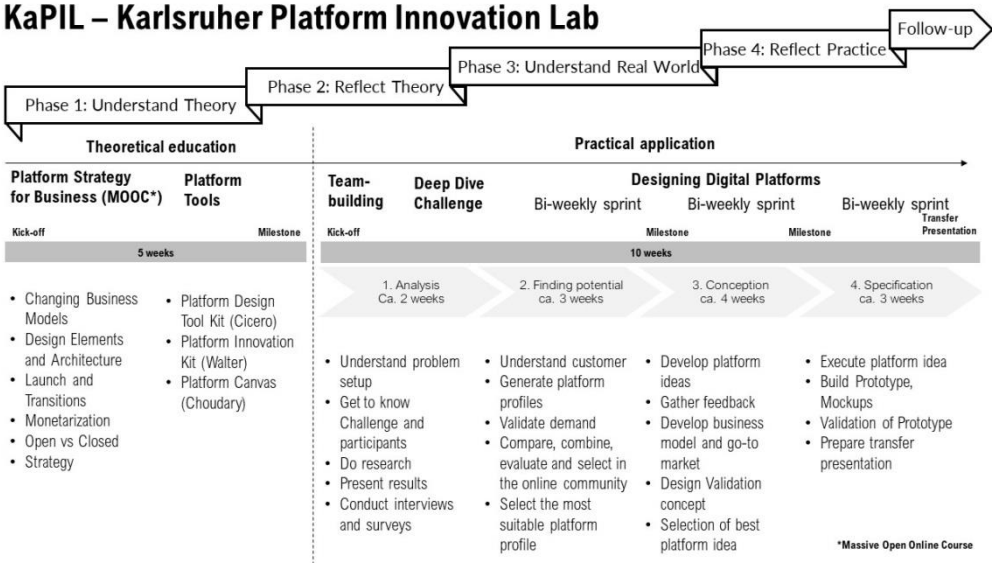
To investigate this matter, assume that the quality of a designed and verified platform business model depends on several factors such as the suitability of design tools for explorative ideation, structuredness of the ideation process, the business context of the application (B2B or B2C), and the level of guidance through coaches or moderators. The focus lies on the first factor – the suitability of design tools. The authors defined several measurable key factors such as familiarity with canvas, comprehensiveness, and capability to display certain platform elements to investigate this factor in detail (see Figure 6). These key factors are used as a basis for the survey design.

Design and Implementation of KaPIL – Karlsruher Platform Innovation Lab

The authors adapted the concept of a Live-Lab and added elements from Smart Education approaches and special digital platform design tool as described in the theoretical part of this paper. Workshops and discussions among the

researchers resulted in a process model (see Figure 7). The authors tested KaPIL empirically by collaborating with the company STIHL. The researchers collected quantitative and qualitative feedback data throughout the complete Live-Lab execution via digital surveys among participating students. It helped the researchers derive possibilities for improving the concept and validating parts of it.

Figure 7. *Process Model of the Karlsruhe Platform Innovation Lab (KaPIL)*



KaPIL ran for 15 weeks with 22 students from the Master's program in Industrial Engineering, International Management and Technology Entrepreneurship. Students were divided into five project teams working on real-world challenges, supported by two coaches. Three of the five project teams worked on an exploration case and two project teams worked on a digital platform that was about to enter the market. KaPIL consisted of five and one-half theoretical sessions and ten and one-half practical sessions, each lasting about three hours. Students received homework after each session and were graded based on the final presentation regarding the designed digital platform and written report.

In contrast to other Live-Labs, KaPIL was run entirely digitally due to the COVID-19 pandemic. The researcher used software such as Microsoft Teams, Google Jamboard, Lime Survey, and Mentimeter. The teaching was supported by the Massive Open Online Course (MOOC) "Platform Strategy for Business" by Marshall van Alstyne (Van Alstyne 2021) and external speakers. Surveys among the students evaluated the course comprehensibility and other aspects of the lab. Students were taught the following contents: The importance of platform business models, their design and architecture, launching strategies, network effects, monetarization strategies, and advantages of closed vs. open design.

Survey Results Regarding Platform Tools and Methods

The first survey was conducted on December 16, 2020, and the second on February 3, 2021. Two fictitious platform tools were inserted as test variables in

the first two questions as answer options to ensure that only unexpected questionnaires were evaluated. In the familiarity study, the test variables were selected, which led to the exclusion of these data sets from the data analysis. Thus, the evaluation included 20 valid data records in the first survey. The second sample is composed of 18 valid data records with the same demographic characteristics.

Four design phases are distinguished concerning the use of the canvases. These are based on the design phases of the Platform Design Toolkit by (Cicero 2019). It differentiates between four stages of development: exploration, strategy design, validation, and prototyping, as well as scaling and growth. Exploration is the initial phase where developers first create a context to identify the digital platform and collect different ideas. In the second phase, the strategy design takes place. A concrete platform strategy needs to be developed and gradually validated with the network participants. In the validation phase, the riskiest business platform strategy hypotheses are tested using an MVP, interviews, or surveys. After successful validation, the scaling and growth phase follows. Here, participants are acquired, activated, and network effects are initiated and promoted between and within participant groups (Cicero 2019). The PBMC is most frequently applied in the first three phases. With existing platform business models, all canvases are used relatively frequently: 90% of the surveyed use the PVC, 85% the PBMC, and 80% the PC. Only the PDC was used by every second person. A statement on the earlier design phases is only meaningful in the second survey since test persons are in earlier design stages as part of the challenge.

Examining specifics in the B2B environment provides a clear picture in the first dataset. The following characteristics for customers in B2B market are mentioned: a smaller number of customers, the presence of direct and indirect customers, heterogeneous requirements, a different way of addressing customers and -acquisition, multi-personnel decisions, higher quality standards, and personal contact. According to the students, a particular challenge is accumulating enough customers to generate network effects in B2B markets. Another remark was the relevance of data protection, which is higher in the B2B context than in the B2C context.

In addition, other decisive factors that need to be considered were collected. The most frequently mentioned challenge is identifying customers. Furthermore, there are difficulties in choosing a monetization strategy, collecting sufficient information in the B2B market, generating network effects, the strong competitive environment, and a lack of knowledge about players and value-added processes in the timber industry.

The evaluation of the results gives the following picture. The PBMC by (Walter 2020) is the favorite tool among users and is considered the easiest to understand and use. It has the highest use frequency and the second-highest use intensity. At the time of the first survey, 80% of the sample was familiar with it. After that, the PVC was used second most frequently for mapping existing platform business models. On average, Choudary’s PC received the lowest rating for all test characteristics. Based on the investigation results, the PBMC will

initially be evaluated as the most suitable modeling tool for platform design. Table 2 shows an overview of the main results of the dataset.

Table 2. *Survey Results Regarding the Platform Design Canvases*

Variables	Scale	Metric	PBMC	PVC	PDC	PC
Preferred Canvas	Nominal	Frequency	67%	11%	17%	6%
Easy to use	Nominal	Frequency	50%	11%	28%	11%
Comprehensibility	Nominal	Frequency	61%	6%	28%	6%
Phase 1: Exploration	Nominal	Frequency	50%	33%	28%	22%
Phase 2: First Draft	Nominal	Frequency	44%	39%	11%	28%
Phase 3: Comprehensive Strategy	Nominal	Frequency	44%	28%	6%	0%
Phase 4: Existing Business Model	Nominal	Frequency	67%	67%	44%	61%
Stakeholder perspective	6-Value-Scale	Mean	4	3.8	3.2	3.5
Completeness	6-Value-Scale	Mean	5	3.5	4.1	3.7
Hypothesis collection	6-Value-Scale	Mean	4.5	3.6	3.8	3.6
Key Stakeholders	6-Value-Scale	Mean	4.8	4.5	3.9	3.3
Key Channels	6-Value-Scale	Mean	4.9	3.7	4,2	4.3
Value Proposition	6-Value-Scale	Mean	5	4.8	4.2	4
Network effects	6-Value-Scale	Mean	4.8	4.5	3.9	2.9

Discussion

The research was set out to expand the first step of the Smart Platform Experiment Cycle. Furthermore, this research aimed to develop a Live-Lab as a validation environment to test digital platform tools and methods. The method used for empirical research was online surveys. The advantage of this method is that the surveys took place independent of place and time during the Covid-19 pandemic. In addition, the standardized survey enabled a statistical evaluation of quantitative data to measure frequencies. The combination of closed and open questions enabled collecting quantitative and qualitative data. However, it was disadvantageous that no questions regarding the specific response behavior were recorded. Another difficulty is recruiting a sufficient number of subjects (Bortz and Döring 2006, p. 260 f.). The subjects' characteristics and compliance with the scientific quality criteria of quantitative research determine the validity and quality of the survey results (Goldenstein et al. 2018, p. 123). The research results were based on the knowledge gained from two time-delayed, quantitative surveys with students. However, in practice, the target group of the platform tools should include platform developers and entrepreneurs. Accordingly, it is necessary to examine to what extent the characteristics of the test persons match the target group characteristics to make a statement about the reliability and transferability of the test results to the target group. The study subjects were between 20 and 29 years old and students from three different master's courses: international management, industrial engineering, and technology entrepreneurship. The

students developed and validated a digital B2B platform for a real-use case in corporate practice. A special characteristic of the participants is that they have a thorough knowledge of the various design tools and have already applied them to existing digital platforms. If one compares the student characteristics with the entrepreneurial characteristics, the following can be established: The students represent the majority of the entrepreneurial age group. A study by Statista GmbH about "Distribution of company founders in Germany by age group in 2019" shows that around half of the entrepreneurs are between 18 and 34 years old (Statista GmbH 2020). Another entrepreneurial characteristic is working in a start-up or an innovation department of a company, little time and money at hand but having capacities (Hell and Gatzka 2018). The students have these characteristics by training future company founders as part of the technology entrepreneurship masters. In addition, the students in the challenge in the role of digital platform developer. However, due to the repeated, slightly modified implementation of the survey, the reliability of the results could be increased.

The following recommendations for future research can be derived from the stated weaknesses and limitations of the research method and the gained knowledge. The findings, including the platform design, should be further validated in terms of applicability in business practice. It can take placed directly in startups for B2B platforms or in the context of Live-Lab studies. Live-Lab studies represent a compromise between field and laboratory studies, in which the validation environment for evaluating the tools and methods under realistic conditions and under relatively high examination environment controlled. An example is innovative company projects in cooperation with students, such as the challenge carried out with STIHL as part of the course. The application of the tools and methods in operational practice will increase its significance and transferability of the test results to corporate practice.

Running KaPIL for the first time revealed the following insights: The applied software tools helped the researchers to organize the lab, conduct polls, and collect feedback regularly. Students criticized that the theoretical and practical parts of the lab took place separately. Consequently, the practice part should commence earlier so that there is an overlay between theory and practice. Future research is required to show which canvases and platform design tools are more adequate to design an initial platform business model and whether certain problem cases are more suitable for this setting.

Conclusion

This research shows that the Live-Lab: KaPIL – Karlsruher Platform Innovation Lab can be used as a Live-Lab to design digital platforms through cooperation between academia and corporates and test related tools and methods. Furthermore, the Platform Design Canvas, the Platform Business Model Canvas by Walter (2020), and the Platform Design Canvas by Cicero (2020) can expand step (1) of SPEC – Smart Platform Experiment Cycle.

In the future, a more structured approach is needed to design digital platforms during the practical application of KaPIL. One possible solution might be to implement an explorative, quickly paced design sprint. Additionally, it should be supplemented by innovation coaching methods to guide the development teams. In future research, more applications of KaPIL are needed to validate its robustness and extend it to other digital platform tools and methods.

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