The Impact of Prototyping on the Survival Chances of Digital Early-Stage Startups: Findings and Insights from Explorative Expert Interviews

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Abstract: The products of digital entrepreneurs are highly innovative, and their business models contribute to the prosperity and further development of the economy and society. However, studies indicate that most of all startups fail, particularly during the early stages of their business journey. Prototyping as part of Lean Startup or Business Model Testing approaches, can assist digital early-stage startups in navigating uncertainty and achieving successful product launches. However, these methods are applied very individually and there is little empirical research on best practices. We therefore conducted 65 explorative expert interviews and asked successful startups about their prototyping practices. Our results include learnings on the prototyping process and the testing format, the role of the founding team during prototyping practices, the customer focus and the role of networks. Our study adds important details to theory and practice of the innovation and prototyping processes of digital early-stage startups. Our results offer actionable advice and guidance to any current and potential entrepreneur, but especially to first-time founders and less experienced executives in early stage-startups. Additionally, our contribution enhances the theoretical understanding of the Lean Startup approach and prototyping practices.

Keywords: business model, prototyping, Lean Startup, expert interviews, digital entrepreneurs

1. Introduction

'A startup is a human institution designed to create a new product or service under conditions of extreme uncertainty.' (Ries, 2011) The products of startups stand for innovation and technological progress, and their business models are often highly digital. Startups are innovation drivers for economic and social progress, are hopefuls for the creation of new jobs, are growth-oriented and their product or business model is highly innovative (Blank & Dorf, 2014; Kollmann et al., 2017*).* However, many of them fail especially in the early stages (CB Insights, 2021; Lai & Lin, 2015). The early stage is divided into the seed phase and the startup phase. The seed phase is the pre-founding phase. In the seed phase, there is only an idea for a product, a service or a prototype that has not yet been fully developed. The startup phase comprises the steps from founding the company to market launch. An advanced prototype exists, or the product is largely fully developed and must be prepared for market launch. (Deutsche Startups, n.d.). The primary factors contributing to the uncertainty of early-stage startup processes are the highly volatile and unpredictable conditions in which startups operate.

There are different theoretical approaches that discuss early-stage entrepreneurial innovation processes like the Lean Startup (Ries ,2011), Effectuation (Sarasvathy, 2001) or Business Model Testing (Bland & Osterwalder, 2019). Prototyping is an essential aspect of the early-stage innovation process of startups. Prototypes are 'working models' and function like a steppingstone on the journey towards a new product, service or Business Model (Tidd & Bessant, 2019). The principle of creating a minimum viable product (MVP) (Ries, 2011) is a certain kind of prototype. According to Ries (2009), 'the minimum viable product is that version of a new product which allows a team to collect the maximum amount of validated learning about customers with the least effort.' This kind of prototype is used by many successful startups nowadays. However, in practice the innovation process and the implementation of prototyping is still done in a very individual way. Important learning only crystallizes over time without being systematically recorded. Therefore, our research focusses on best practices and learnings of successful digital entrepreneurs. The main research questions are: How did digital entrepreneurs in their early stages effectively transform their innovative business ideas into tangible, market-ready products? How did they validate their ideas? What role did prototyping play in their innovation process? What can we learn from their successes? There is little empirical data on the role of prototyping in the innovation process of startups (Shepherd & Gruber, 2021; Dahle & Steinert, 2016; Gutbrod & Tichy, 2017). We therefore conducted 65 explorative expert interviews with founders of successful digital startups to discuss their experiences. We only talked to founders or core team members of startups with digital products and business models whose context is shaped by a high level of uncertainty and who are situated in Germany. Further, we focused on startup companies that are already successful in the market for a couple of years.

2. Theoretical background

Entrepreneurial processes, especially in the early stages of business development, are extremely uncertain. At the beginning, entrepreneurs almost never know what the final product, business model or service will look like. Often their approaches are very different from the patterns of established firms (Richter et al., 2018). Entrepreneurs navigate through an environment of constant uncertainty. In addition to external uncertainty, there is the liability of newness (resource poverty, lack of legitimacy, weak ties and weakness in competition) faced by innovation driven digital startups. Digital startups are often also referred to as technology startups and defined as follows: “Companies whose purpose is to bring technology products or services to market. These companies deliver new technology products or services or deliver existing technology products or services in new ways.” (Funderclub, n.d.). Only 40% of the companies survive the first years of their existence (Lai & Lin, 2015). For digital startups, the survival rate is often even lower than that of traditional small or medium-sized companies because the degree of uncertainty is higher. Digital and innovative startups are not only new to the market but also differ from existing companies in terms of their product, business model, and the market they serve (Amason et al., 2006). The aim is therefore to find out what role prototyping plays in the innovation process for the survival chances of digital startups. Most of the time, the reasons lie with the founders or employees or their attitude. Founders education, industry experience and team composition are found to have a high impact on startup survival (Eliakis et al., 2020; Song et al., 2008; Richter, 2018). In part, the reasons for the success or failure of startups are also seen in the existing networks and the extent to which strong and weak ties influence important founding processes such as discovering opportunities, securing resources, and obtaining legitimacy (Elfring & Hulsink, 2003; Eliakis et al., 2020; Welter, 2011). From our literature review we observed that various parameters such as team, context or product influence a successful entrepreneurial process. But the process itself also plays an important role. While founders may be well-educated and possess relevant industry experience, without a viable business idea or opportunity, a successful market launch becomes unattainable.

The business idea can be the result of a discovery or creation process (Alvarez & Barney, 2007). In the Discovery School principles are based on systematic analysis and evidence ("thinking first"). The reduction of uncertainty is done through extensive research and planning. Goals and strategies are initially set and actions are guided by plans. An example in startup practice is the business plan. In the Creation School approaches and, principles are based on pragmatic action ("doing first"). The focus lies on the reduction of uncertainty through early interaction with customers and learning effects. Goals and strategies are readjusted or emerge during the process. An example in startup practice is the Lean Startup method. Research shows that both approaches are important, but that especially in the early stages, the Creation School such as the Lean Startup method, that focuses on prototyping, are more likely to lead to success than the Discovery School (Brinkmann, 2010, Grichnik et al., 2017).

The starting point of the Lean Startup methodology is a high level of uncertainty, which is why only a few entrepreneurial ideas are successfully implemented (Blank, 2013). Following the Lean Startup approach uncertainty can be diminished by continuously formulating working hypothesis related to business ideas, testing the validity of them and thereby quickly expanding the knowledge base (Mansoori & Lackeus, 2019; Murray & Tripsas, 2004). The build-measure-feedback loop is a model which shows how to build the future through testing thoroughly designed hypothesis. Tactics are targeted experiments, interviews with customers, physical prototypes, A/B Tests, concierge MVPs, or fake door tests (Mansoori & Lackeus, 2019). The Lean Startup approach has its origins in the entrepreneurial practice. The basic idea is to turn away from traditional planning and move towards fast action and fast failure. The maxims are, therefore, to experiment instead of planning in detail, to develop iteratively instead of making high investments in advance, and to seek customer interaction and feedback instead of relying solely on the intuition of the founder (Grichnik et al. , 2017). There is already some research on the survival and growth of digital startups (Eliakis et al., 2020; Song et al., 2008; Richter et al., 2018) but none with a focus on the role of prototyping processes for digital early-stage startups. Our research fills this gap and asks for the most important factors that can positively influence the prototyping of startups in the innovation process.

3. Methodology and data collection: Explorative expert interviews

Exploratory expert interviews were conducted to investigate the research field. The focus of the interviews was on collecting information on a relatively unexplored subject. Up to now, there have been only a few qualitative empirical studies on prototyping processes of early-stage digital startups (Shepherd & Gruber, 2021; Dahle & Steinert, 2016; Gutbrod & Tichy, 2017). Therefore, new scientific hypotheses and theories need to be developed. This will provide a basis for further research on the topic. The expert interview is a special method of the

explorative interview. In an expert interview, the focus is on gaining knowledge from people who have special and retrievable knowledge in their field through their function or profession (Mayer, 2013). Nevertheless, the personal perspective of the interviewee usually influences the statements obtained in the interview. For this reason, information on a subject should be gathered from several interviewees. In our case, we interviewed only successful entrepreneurs who have already founded one or more companies, and whose companies have been successful in the market for several years. A total of 65 entrepreneurs were interviewed to provide at statements that go beyond purely personal perspectives. Each interview lasted about 40 minutes. 'Expert interviews were conducted for as long and as many times as necessary until all the information needed to answer the research question had been collected and repetitive statements were made on specific topics' (Gläser & Laudel, 2010, p. 117f). The transcripts were read and text sections of interest were marked and given headings (Meuser & Nagel, 2002). After reviewing all the interviews, topics were grouped together and marked with codes. The codes were formed only for topics that appeared repeatedly in different interviews (Meuser & Nagel, 2002). Finally, correlations between the codes were examined and interpretations formulated. This interpretation is presented below.

4. Results

A total of 65 founders from Germany were interviewed. All of the companies surveyed are still active in the market. The average age of the founders at the time of the survey was 38 years. The average age at the time of founding was 31 years. A majority of the founding teams consist of 2 or more founders (90.4% in total). A quarter of the respondents are female (26%). Despite this low proportion, women are slightly overrepresented in this survey compared to the total of German startups (according to the German Startup Monitor, the proportion of women in startups is 20.3%). The startups are predominantly in the digital sector (e. g. FoodTech, FinTech, RetailTech, GreenTech, HRTech, MarTech, Travel-Tech, IoT, MedTech, InsuranceTech, AI, HealthTech, 3D Printing, BioTech, VR/AR). Out of all the founders, 52.1% are focused on B2B (business-to-business), 15.1% on B2C (business-to-consumer), and 32.9% on both B2B and B2C. A clear majority of the founders rate the innovation and complexity of their own products as high or very high (Likert scale: low, rather low, medium, rather high, high). None of the founders estimate the degree of innovation of their own products as low. With regard to the novelty of the market, over 60% of the founders rate the degree of novelty as high. Only a few of the respondents rate the degree of market novelty as rather low. The customer pain point is rated as high. The intensity of competition is rated as high or very high. Accordingly, the interviewees are primarily startups that operate in a highly uncertain environment. Based on our explorative expert interviews we identified four different themes and associated sub-themes (see table 1).

Table 1: Findings from explorative expert interviews with 65 startup founders

1 The Founding Team	
code 1.1	**Team composition**
code 1.1.1	Idea phase and development phase often start with the participation of at least 2 persons.
code 1.1.2	Having a diverse team for prototyping, including technical experts (like computer scientists or engineers), can be advantageous, but it is not necessarily essential for testing ideas via prototyping.
code 1.2	**Knowledge Acquisition**
code 1.2.1	Testing becomes crucial when there is insufficient market knowledge.
code 1.2.2	Testing is conducted not only in situations where there is limited market knowledge, but also when there is a need for qualitative product improvement.
code 1.2.3	Industry experience is not a prerequisite but helpful to shorten the process of experimentation.
code 1.3	**Attitudes and behaviour of the founding team**
code 1.5	Testing requires an experimental behaviour and attitude on the part of the founding team.
code 1.6	The founder knows whether to stick to an idea or abandon it (pivot or persevere).
code 1.7	The founder is aware of the open-endedness of the innovation process and acts pro-actively to achieve results.
code 1.8	Founders should personally conduct experiments and gain experience to optimize their own learning curve and learn from mistakes.
code 1.9	Conducting experiments is open, playful and yet rigorous in evaluation.
code 1.10	Testing requires courage and stepping out of the comfort zone.
code 1.11	Intrinsic motivation supports perseverance in the experimentation process.
2 Prototyping Process and MVP	
code 2.1	**Timing, speed, frequency and type of testing are important factors for successfully dealing with uncertainty in the innovation process of early-stage entrepreneurs.**
code 2.1.1	Prototyping is carried out until a product-market fit has been achieved. When a scalable Business Model is found, prototyping ends for the time being. Some entrepreneurs warn against ending prototyping too early.
code 2.1.2	Testing of the idea should start very early. The aim is to make sure that a market exists before market entry.

code 2.1.3	It does not remain with one test, but the potential product is continuously tested in the different development stages with a certain, increasingly specific customer base.
code 2.1.4	Prototyping increases the speed of the innovation process for startups. The time used plays a significant role due to the limited resources available.
code 2.1.5	At the heart of prototyping is the learning process. This involves learning from customer feedback and founder's mistakes.
code 2.2	**The prototype (MVP) must have certain characteristics so that it can be successfully used in the innovation process of startups**
code 2.2.1	Tests are deliberately open in nature and quickly prepared and executed. They invite collaboration.
code 2.2.2	Focus on necessary product components is crucial. Often the application is thought too complex at the beginning.
code 2.2.3	Testing can be done very cheaply with the help of digital tools and programmes. Therefore, prototyping is especially but not only suitable for startups in the digital sector.
code 2.2.4	At the beginning of prototyping, products and designs from competitors serve as inspiration for the creation of an MVP.
code 2.2.5	(Mega-)trends such as sustainability or health are reflected by founders and consciously used in the creation of MVPs.
code 2.2.6	In prototyping, not only the product but the entire Business Model is usually tested (customer relations, channels, revenue generation, ...).
code 2.2.7	Founders know different types of prototypes and use them consciously (the following prototypes are most commonly used: A/B tests, interviews, concierge test, storytelling, pop-up stores, mailings, flyers, posters, surveys, 3D prints, Power Point presentations, events).
code 2.2.8	Storytelling accompanies the use of prototyping. Clear, structured and open communication is essential.
code 2.2.9	When using prototypes, the measurability of the pre-defined hypotheses must be ensured.
code 2.2.10	Fake it until you make it! The prototype is representative of the final product or service. The customer usually does not know that the final product does not yet exist.
3 Customer Focus	
code 3.1	**Nature of relationship with the customer**
code 3.1.1	The potential customer is at the centre of prototyping in the innovation process of startups as a partner and target group.
code 3.1.2	During the initial stages of the innovation process, prioritizing customer interaction and feedback is more crucial than achieving technical perfection of the prototype.
code 3.1.3	Prototyping is about a deep engagement with customer needs, not about scaling (Do things that don`t scale!).
code 3.1.4	Startups often commence with close collaboration with a small, typically homogeneous customer group, gradually expanding the customer base as they progress.
code 3.1.5	Where the customer pain is high, customers have a high willingness to participate in the product development or prototyping process. (e.g., in the construction industry or in the recruitment sector).
code 3.1.6	For ideas/opportunities that are complex in nature, cooperation with customers is even more central for a startup.
code 3.1.7	Customer feedback should always be questioned and critically reflected upon by the founder. Often it serves to give food for thought. Sometimes customer feedback is misleading and should therefore not be implemented by the founder.
code 3.1.8	Test customers are often converted to permanent customers. Therefore, prototyping can also be seen as a form of customer acquisition especially for B2B startups.
code 3.1.9	Prototyping serves to build up or increase trust and legitimacy on the customer side.
code 3.2	**Goals of customer interaction**
code 3.2.1	Testing aims to identify the right customers and to understand and satisfy the real customer needs.
code 3.2.2	Testing is used to evaluate the willingness to pay and the pricing level with the help of potential customers.
code 3.2.3	The level of payment for an unfinished product is not the focus of testing. Rather, it is about checking the existing commitment of potential customers and thus their feedback quality.
code 3.2.4	Testing helps to define the target markets (regional/national/international).
4 Networks	
code 4.1	**Characteristics of networks**
code 4.1.1	Networks are of high relevance for the prototyping process.
code 4.1.2	Network building should be very specific to the individual product and market.
code 4.1.3	Networks influence the final characteristics of the product and Business Model.
code 4.1.4	Coincidence often plays an important role in the creation of suitable networks. It is therefore important for a startup to get the idea out and tell the public about it.
code 4.1.5	Founders talk openly about their ideas in relevant networks. The fear of idea theft can be assessed as rather low.
code 4.2	**Network partners**
code 4.2.1	Testing involves the use of existing networks including friends and family as well as their targeted extension.
code 4.2.2	Social media networks are important for reducing uncertainty in the startup process as well as for customer acquisition. LinkedIn is the most relevant B2B social network, especially if there are no relevant industry contacts.
code 4.2.3	Networks to traditional media are relevant. Coverage in traditional media (PR) increases credibility and trust in startup projects and has a high impact on success during and after the prototyping process.
code 4.2.4	Crowdfunding, accelerator programmes, startup competitions and events are significant networking activities in the context of prototyping.

5. Discussion

The majority of the entrepreneurs interviewed acknowledged consciously adopting the Lean Startup approach for their prototyping process, even if they were not explicitly asked about it. However, the question arises as to how exactly the methodology was applied and what learnings result from it.

5.1 The founding team

Following our study, startup ideas are almost exclusively developed by teams (more than 90 %) (code: 1.1.1). In the Lean Startup approach (Ries, 2011), the founder is usually supported by a team. Depending on the characteristics, these people can also be replaced by others. Our research shows, that teams are not dependent on technical expertise when prototyping (code: 1.1.2). An experimental attitude holds greater significance than technical know-how (codes: 1.5, 1.1.2). Founders conduct experiments themselves (code: 1.8). Delegation of this critical task to others is discouraged. Our study further demonstrates that founders rely on intuition or draw from their experience to determine whether to persevere with an idea or to pivot (code: 1.6). Not all teams have previous experience in founding (code: 1.2.3). The teams interviewed confirmed that prototyping supports the development of knowledge about the market and the improvement of the product quality (codes: 1.2.1, 1.2.2).

Following the methodology, the acquisition of knowledge plays a pivotal role in the entrepreneurial process. It is expanded through the entrepreneur's information gathering activities, where theybusine explicitly embrace contingencies and surprises (Mansoori & Lackéus, 2019). According to our expert entrepreneurs prototyping is seen as a playful process, but the focus is on rigorously measuring hypotheses (code: 1.9). Founders frequently step out of their comfort zone while testing business ideas, driven by their intrinsic motivation to persist until the product-market fit is achieved (codes: 1.10, 1.11). The Lean Startup (Ries, 2011) underlines that redirections happen any time, when new information is discovered. Almost all experts interviewed follow this logic.

5.2 Prototyping process and MVP

Our research shows that the process of prototyping is preferably carried out until a product-market fit is achieved and should not end earlier (code: 2.1.1). Further, the experimental prototyping process should begin as early as possible (code: 2.1.2). The process does not stop at one test, but is repeated and carried out with an increasingly specific customer base (code: 2.1.3). Prototyping accelerates the early-stage innovation process, which is why prototyping helps to save resources (code: 2.1.4). The focus is on the learning process, which is primarily fed by customer feedback and the founder’s reflection on his or her mistakes (code: 2.1.5). The Lean Startup approach puts iterative processes that are triggered by feedback and learning opportunities at center stage. Feedback from the external environment is the source of continuous learning. Continuous learning shapes the path of the innovation process (Mansoori & Lackéus, 2019; Minniti & Bygrave, 2001). Our findings are in line with the Lean Startup methodology. We add further details and found out that timing, speed, frequency and the testing format are important for successful prototyping experiments (code: 2.1). Prototyping typically centers around the product or service, but it encompasses the entire business model as well. Founders rigorously test hypotheses that result from the initial design of the business model. Business models are often designed by drawing inspiration from competitors, which serves as a starting point (code: 2.2.4). Existing social trends such as sustainability also influence the early prototyping phase (code: 2.2.5). Founders should make sure that the first product draft is not too complex and contains only the most necessary features to test the customer benefits.

The prototype must have certain characteristics in order to be used successfully in the prototyping process. First of all, it must be openly designed and quickly prepared. It serves the purpose of social cooperation (code: 2.2.1). Test formats are inexpensive to produce (code: 2.2.3). The prototype must fit the product or business model and should be designed to allow hypothesis testing (code: 2.2.6). Most commonly used are A/B tests, interviews, concierge tests, storytelling, pop-up stores, mailings, flyers, posters, surveys, 3D prints, power point presentations and events (code: 2.2.7). The prototype is embedded in a clearly structured and open storytelling or narrative (code: 2.2.8). Although the prototype represents the final product or business model, the customer is usually not aware that it is only a prototype he or she is using/testing (code: 2.2.10). In the Lean Startup methodology (Ries, 2011) instead of a comprehensive business plan, founders use a business model approach such as the Business Model Canvas framework (Osterwalder & Peigneur, 2010). Using the nine building blocks of the canvas framework, they summarize their hypotheses. A network of users or partners acts as a feedback provider to test hypotheses. Value is created not only for the customers but also for entrepreneurs and their collaborators. In both cases value creation is the goal of the entire entrepreneurial process (Mansoori & Lackéus, 2019).

5.3 Customer focus

Customer focus is the most frequently mentioned topic by the entrepreneurs interviewed. The customer is a partner at eye level and a target group in equal measure (code: 3.1.1). Founders therefore emphasize the importance of direct customer contact and interaction (code: 3.1.2). The founder should proactively engage with potential customers by being present in places where they are likely to be found. Close cooperation with the customer is more important than the technically perfect implementation of the prototype and deep engagement is more important in the prototyping phase than scaling activities (codes: 3.1.2; 3.1.3), which is in line with the Lean Startup methodology (Ries, 2011). The primary objective of prototyping is to identify the ideal customers and gain a deep understanding of their needs in order to tailor the product accordingly. Identifying willingness to pay and pricing are further goals of prototyping (code: 3.2.2). This is not primarily about the amount of payment, but also about determining the sincerity of the customer's interest in order to be able to assess the respective value of the customer feedback (code: 3.2.3). The greater the need and the customer pain, the more potential customers are willing to cooperate with founders (code: 3.1.5). During the prototyping process, a relationship of trust develops between founders and clients (code: 3.1.9). Frequently, test customers become the founders' initial paying customers (code: 3.1.8). In the early stages, the customer base is typically small and relatively homogeneous, gradually expanding over time as the process unfolds (code: 3.1.4). The founder must be able to critically reflect on customer feedback. Not every hint mentioned by the customer should be taken into account by the founder (code: 3.1.7). Therefore, customer interaction is a permanent process of negotiation.

Some aspects of the Lean Startup approach (Ries, 2011) could be confirmed by this empirical study. For example, the founder should distance himself from customers and critically reflect customer feedback. Nevertheless, the customer is more than just a feedback provider. Moreover, our study identifies significant characteristics of customer interaction, which yield insights that are subsequently utilized for further refinement of the business model or product idea (Ries, 2011).

5.4 Networks

Existing and emerging networks are indispensable prerequisites for the prototyping process (code: 4.1.1). Networks are continuously expanded at the beginning of prototyping. In particular, close connections to a specific network of potential customers are established. The interaction with the existing network significantly impacts the ongoing evolution of the business model (code: 4.1.3). Social media networks such as LinkedIn are of very high relevance, especially in the B2B sector (code: 4.2.2). But also, connections to traditional media have an impact, as they increase the trust in the team and their product, which in turn has a positive effect on the interaction with potential customers (code: 4.2.3). Important networking activities during prototyping are also participation in crowdfunding campaigns, accelerator programs and startup competitions (code: 4.2.4). Founders talk proactively and frequently about their ideas and thus increase the likelihood of finding the right partners.

The fear of idea theft is typically not a significant concern for most founders (code: 4.1.5). Existing research underlines that interactions with others are crucial for entrepreneurs (Sarasvathy & Venkataraman, 2011). They interact with stakeholders who are involved in the innovation process and stakeholders who only indirectly influence the trajectory of the value creation (Mansoori & Lackéus, 2019). The network concept of the Lean Startup approach, however, is not sufficient to represent the presented importance of different stakeholder groups. In a large part of the interviews, network partners such as family, friends, other founders, as well as acquaintances, play an important role. Here, the network concept of the Effectuation approach (Sarasvathy, 2001) seems more suitable as a basis for explanation. In Effectuation the management of social networks is an important aspect of integrating customers, suppliers or users into the innovation process. The concept of the team is broader and the boundaries are fluid and permeable.

6. Conclusion

Our findings revealed four main topics and related sub-themes (see table 1) that illustrate how digital entrepreneurs employ experimentation to convert business ideas into viable products. The main themes include networks, customer focus, prototyping process and MVP, as well as core team attitudes. These topics were derived inductively and exclusively from the transcribed interviews. They emerged after interviewing founders about prototyping and its role in the innovation process. It can therefore be assumed that these four topics have an important influence on successful prototyping. Prototyping helps in particular to gain relevant market knowledge, to improve the quality of products and business models before market entry, to ensure success in the early startup phase even without technical co-founders, to increase the speed of the innovation process and

thus save resources, to successfully develop products and business models that are urgently needed in the market, to win the first real customers, to build trust and legitimacy for startup, product and business model and to facilitate identifying appropriate pricing strategies. Prototyping was central to the early founding process for all the startups interviewed. Almost all respondents based the practices of prototyping on the Lean Startup approach, although the method was interpreted freely. The focal point was not always on building a classic MVP, i.e., a prototype that contains all the essential features of the final product or business model. Further, our sample shows that the customer has an active role and partly becomes a co-creator during the innovation process. This is in contrast to the Lean Startup approach, where customers are known to take on a rather passive role (Ries, 2011). Additionally, networks play an exceptionally important part in the success of prototyping.

However, the network approach of the interviewed founders is more similar to the network approach as it became known from Effectuation research (Sarasvathy, 2001). The integration of network partners as active idea providers and creators, is more prominent in our research than the Lean Startup approach proposes. This shows that the influence of networks, customers and MVP formats on the decision-making processes of early-stage startups are of high importance and require further research. The adaptation of product and business model is crucial for the success of startups and the customer plays the most important role in this. Successful interaction with potential customers can massively shorten the time between idea and market entry if it is done correctly (Zalewska-Kurek et al. 2016). This saves startups resources and enables them to reach the market fit faster and grow successfully. Our article provides important clues on how successful customer interaction takes place. For the practical implementation of startup support programs this means to focus more on the prototyping process and provide the corresponding resources and knowledge. Prototyping could also play a greater role in the educational context, e.g., in universities and research institutes, but also in incubators, accelerators, startup competitions, investor pitches, investment forums, trade fairs, exhibitions and events. In theoretical terms our research has contributed valuable insights to the existing knowledge about the Lean Startup method und prototyping in the context of the Creation School in general. Future studies could compare these findings with other methods that belong to the Creation School such as Design Thinking (Brown, 2008), Effectuation (Sarasvathy, 2001), or Business Model Testing (Osterwalder & Pigneur, 2010; Bland & Osterwalder, 2019). The study has some limitations. For example, the hypotheses were generated but not tested in a quantitative study or mixed methods analysis. The statements are also limited to the geographical area of Germany and in particular Berlin, the startup capital. International studies can test the validity of the statements for other cultural contexts, more rural regions or other National Innovation Systems.

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