Creativity and Entrepreneurship - The Role of Creativity Support Systems for Start-ups

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CREATIVITY AND ENTREPRENEURSHIP – THE ROLE OF CREATIVITY SUPPORT SYSTEMS FOR START-UPS

Completed Research

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Abstract

Successful start-ups require a number of organizational, efficient and systematic entrepreneurial actions. In addition to the acquisition and the successful use of resources, especially the identification and development of ideas to business models play an important role for the company's success. In this context, creativity exhibits a major importance and creativity support in the phase entrepreneurial activities turn out to be essential. This article discusses the relationship between creativity support, information technology and entrepreneurial activities. With a selective exploratory study, we deepened the understanding of creativity support and information technology on entrepreneurship and especially revealed a lack of the use of creativity support systems, which can aid the development of innovative ideas and lead to beneficial products and services. The compiled results show that the use of creativity techniques and creativity support systems for start-ups is an important component that can fundamentally contribute to the success.

Keywords: Creativity, Entrepreneurship, Start-up, Creativity Support System.
1 Introduction and Motivation

Due to a steady emergence of new technologies, entrepreneurs stand in front of many significant new business opportunities. These opportunities, however, go along with an excessive competition and thus a high need of being innovative (McMullen and Shepherd, 2006). Constructing innovative business models forces entrepreneurs to generate valuable ideas, which have the potential to become highly beneficial products or services. Good ideas are often judged as being creative to the extent that they are novel and appropriate, useful, correct, or a valuable response to a task (Amabile, 1983), and hence can develop into successful innovations. Therefore, the necessity of being creative, to build an innovative idea and to develop a successful start-up is not to be ignored.

Various researchers have already shown the direct relation between creativity and entrepreneurship. Even so, Stein (1974) claimed that the creative ability and the entrepreneurial ability are separate constructs (Stein, 1974), it was refuted in 1984 by Gilad and in following studies, stating that creativity and entrepreneurship can not be separated (Gilad, 1984; Ko and Butler, 2007; Whiting, 1988). In 1988, Whiting analysed personal characteristics and skills of entrepreneurs and compared them to characteristics attributed to persons identified as more creative. He identified comprehensive similarities between creativity-relevant skills and characteristics of entrepreneurial persons. Whether creativity is important for entrepreneurial people and whether creative thinking enhances entrepreneurial activities has lead to continuous research over the years (Fillis and Rentschler 2005, 2010; Fillis 2007; Ko and Butler 2007). In summon it can be said, that creativity is in fact highly related to the success of entrepreneurial activities, however specific characteristics and influences still need to be researched in depth. This raises the question, to what extent the support with creativity techniques in an ideation process affects the success or failure of new businesses. To succeed, entrepreneurs should generate valuable ideas for new services, which are attractive for identifiable markets and have the potential to succeed. A central element in entrepreneurship is the generation of innovative products, services or new business models based on valuable and novel ideas. In addition, to the creation of new ideas, the optimization of existing products and the implementation and the ability to convince the customers are important criterions. Ward called the idea generation process as the lifeblood of the entrepreneurship (Ward, 2004) and Zhou points out to the indispensability of creativity for entrepreneurship (Zhou, 2008). Ames and Runco (2005) found a relation between divergent thinkers and successful entrepreneurs and even showed evidence that successful entrepreneurs tend to produce more ideas. Thus, through creativity, valuable and even beneficial products and services can be produced, that lead to a competitive advantage (Amabile and Runco, 2005). This, however, mainly depends on the efficient use of the company’s own dynamics and the exceptionally high motivation of the founders and employees (Amabile, 1988; Amabile et al., 1996). Through a structured approach, ideas are generated, which encourage innovation and creativity. An idea is the result of an ideation process, which implies that this process, that is required, can be influenced. Influencing a creative process, consequently influences the creative outcome, which has led to a variety of creativity support techniques. These techniques try to enhance the creative outcome by manipulating and stimulating the creative process (Mumford et al., 2012; Smith, 1998). One popular approach is Brainstorming, developed by Osborn in 1953. Brainstorming aims to increase group creativity by setting a set of rules to better perform as a group (Osborn, 1953). With the rise of the information technology, more research was done on how IT can additionally support the creative process (Massetti, 1996). Electronic Brainstorming for example was able to additionally support creativity and even outperform traditional Brainstorming (Dennis et al., 1999; Dennis and Valacich, 1993; Gallupe et al., 1992). Till now, a numerous number of studies show the potential of IT for creativity support (Dennis and Valacich, 1993; MacCrimmon and Wagner, 1994; Massetti, 1996; Shneiderman, 2007; Valacich et al., 1994). The stringent application of different creativity methods and the use of IT for creativity support can result in concrete and effective solutions (Shneiderman, 2007; Smith, 1998). However, by now, “very little is known about how the process
works, especially with respect to recognizing entrepreneurial opportunities” (Ko and Butler 2007, p. 366). Thus, we aim to gather deeper insights about the understanding of creativity support and especially about the usage of IT during the idea generation of entrepreneurs. In order to achieve this, we conducted a selective survey with 16 entrepreneurs to deeper understand the role of creativity support in entrepreneurial activities. Results of the survey are presented to aid, both, practice to improve idea- tion processes in entrepreneurship and research to further evaluate the role of creativity support and IT in entrepreneurship.

The paper is structured as follows: Section 2 introduces theoretical background and related work, namely definitions of creativity, innovation and entrepreneurship and the role of creativity, information technology and creativity support in entrepreneurial activities. In section 3 our research method is described and results are presented. In section 4 the results are discussed and a conclusion and outlook is given.

2 Theoretical Background

2.1 Innovation and Creativity

Innovation is the answer to an increase in competitive intensity. The ability to develop and implement innovations is closely linked to the competitiveness of a company (Gernonprez et al., 2015; Weerawardena and Mavondo, 2011). Shorter product life cycles and new technologies, especially in the growth sectors, stress the need for innovation. Just as the continued increase of available knowledge, the decreasing half-life of knowledge, i.e. the time in which knowledge is valid and applicable, increases the pressure to innovate (Amabile, 1988; Chesbrough, 2013; Helfat and Peteraf, 2003). Without the use of the term innovation, Schumpeter (1934) defined innovations as the new combinations, with which companies should leave the extended tracks of the static economy (Schumpeter, 1934). However, new knowledge or creative ideas cannot yet be described as innovations (Amabile, 1988; Walton, 2003). An innovation is only an innovation when ideas are transferred to new products or services and are also applied and have penetrated a market (Cropley, 2016; Danneels, 2002). Innovation management involves the systematically support during the entire innovation process from the generation of new ideas to their implementation. There are numerous different phase models for the description of innovation processes, that involve the activities that are needed to move from an idea to its realization (Cropley, 2016; Gernonprez et al., 2015). According to these processes, the phase of idea generation and evaluation is closely linked to creativity (Amabile, 1988, 1983; Mayer, 1999). In addition to the existing information sources, creativity techniques are used to generate ideas in the innovation process (Basadur et al., 1982; Smith, 1998; VanGundy, 1992). Thus, creativity is crucial for innovation.

Creativity is a frequently discussed construct and is regarded as an essential human characteristic. The term creativity is not old and a systematic creativity research began only in the second half of the 20th century (Sternberg and Lubart, 1999). Guilford (1950) coined the term in a speech to the American Psychological Association and reported that only a few publications exist in this area, whereby the interest began to grow in creativity research (Guilford, 1950). The consensus, that a positive relationship between creativity and idea generation exists, prevails in the literature (Amabile, 1983; Runco, 2004). Moreover, creativity is seen as the starting point for innovation and is therefore often associated with the success of companies in the context (Lopez-Cabrales et al., 2009). To date, however, no clear and uniform definition for the construct exists. Creativity can be interpreted in different ways. Rhodes (1961) composed an explanation of the construct with his four P’s of creativity and thus defined a procedural approach of creativity. He divided the construct creativity in four dimensions: product, person, process and press (Rhodes, 1961). Other studies broadened the understanding of creativity and especially extended the deeper understanding of the creative process (Amabile, 1983; Csikszentmihalyi,
In summary, creativity is regarded as the ability to break out of habitual patterns, to change the own perspective and to generate something new and useful. Regardless of whether creativity is considered in relation to people, products and processes, based on an individual or social level, often or rarely occurs, is quantitative or qualitative and is considered to be generally applicable or subject-specific (Mayer, 1999).

The evaluation of creativity is a major task and a known issue in the field of creativity research. Basically, two types of approaches in the evaluation of creativity have been distinguished in the context of idea generation: the qualitative and the quantitative evaluation. The latter is used mainly as an indicator of a successful process of idea generation (Reinig and Briggs, 2006; Shah et al., 2003). The purely quantitative evaluation follows the assumption, that when a large number of ideas are generated, there is a higher probability that among these, a certain proportion of good-quality ideas exist (Osborn, 1953). However, there have already been studies, that have shown that the quantity of ideas is not necessarily correlated with the number of high-quality ideas. Therefore, this measure is to be regarded solely as imperfect in itself (Connolly et al., 1990; Reinig and Briggs, 2008). The qualitative assessment of creativity turns out to be a difficult task, because such review is generally marked as very subjective. Amabile (1982) provided a suitable solution to this problem with her so-called Consensual Assessment Technique. This technique relies on the use of independent experts in the qualitative assessment of creativity and is based on the following assumption: “If appropriate judges independently agree that a given product is highly creative, then it can and must be accepted as such” (Amabile 1982, p. 1002). In 2006, Dean et al. provided a literature review on the identification of creative ideas, by reviewing 90 studies on creativity and idea evaluation. The result of their analysis resulted in comprehensive constructs and scales on idea evaluation and is widely used (Dean et al., 2006).

Creativity support techniques are defined as formalized heuristic methods, to increase the creative power of an individual or a group. Creativity techniques usually use cognitive or social mechanisms to promote creative thinking (Nagasundaram and Bostrom, 1994). The creative process is approached in order to enhance and improve the creative outcome. Creativity techniques intend to support to break away from deliberate patterns and routines and expand the considered solution space (Csikszentmihalyi, 2013; Finke et al., 1996). To date, more than 100 creative techniques were presented in the literature (Knoll et al., 2015; VanGundy, 2008). Even so, many creativity techniques exist, just a minority of these techniques is known, correctly used or even commonly applied in business (Greiner et al., 2009). Information technology has already found a place in the research of creativity and has been identified as a beneficial tool to support creativity. Research and practice has shown, that IT can be effectively used to support creativity, which led to a variety of different systems, that aim to support individual and group creativity (Masseti, 1996; Nakakoji, 2005; Seidel et al., 2010; Shneiderman, 2007). These systems that provide, process or organize information during a creativity process can be referred to as a Creativity Support Systems (CSS) (Shneiderman, 2007). The advantages of CSS are vast and companies highly benefit from their usage, which underlines the importance of CSS in business activities (Cherry and Latulipe, 2014).

2.2 Creativity in Entrepreneurship

Entrepreneurship students are more innovative than others and are more likely to form an innovative problem-solving strategy (Al-Atabi and DeBoer, 2014; Neck et al., 2014; Shane, 2003). The number of already established companies influence the creativity of individuals. Entrepreneurs, who have founded three or more companies show a higher behaviour of idea generation (Ames and Runco, 2005). This fact, additionally deduced that a fundamental relationship between creativity and entrepreneurship exists (Gielenik, 2013). This relationship between creativity and entrepreneurship can be regarded as a reciprocal relationship. On the one hand, there is the assumption that creativity has a positive effect on entrepreneurship. On the other hand, entrepreneurship promotes creativity (Gielenik, 2013). In particular, the impact of creativity on business activities despite the obvious precise delimita-
tation of the two processes, is necessary, in order to illustrate the actual influence (Gielnik et al., 2012). In a study with 130 business students, DeTienne and Chandler (2004) investigated the influence of a developed training, which is to increase the creativity of the students. By enhancing the creativity through the training, the skills to identify business issues should be increased. The components of the training are the assurance of ideas, the expansion of knowledge, wealth of experience and a high level of idea generation. The responsibilities within the components were, for example, to permanently carry a notebook, the exchange of knowledge and ideas in the group, the presentation of ideas in the group, as well as Brainstorming and Brainwriting. The results of the study show a significant promotion of the identification of business ideas through the training (DeTienne and Chandler, 2004). Moreover, Ward (2004) describes conceptual combination, analogous reasoning, abstraction and problem formulation as effective creativity techniques to promote entrepreneurial activities. The conceptual combination assumes, that divergent concepts unrelated to each other, are connected together. With analogous reasoning, knowledge of a particular field is used and transferred to another area. This relation contributes to the solution of the problem. In the case of accessing higher abstract levels to generate new ideas, we speak of abstracting (Ward, 2004). By repeatedly restating the problem, aspects from different angles can be considered. Thus, creative solutions can be found through the reformulation of the problem (Mumford et al., 1997). In addition, a study by Gielnik et al. (2009) shows that divergent thinking positive effects the generation of business ideas. Divergent thinking refers to the ability to create many original ideas (Guilford, 1950). However, convergent thinking has an additional significant impact on this process. Convergent thinking is the ability to think rigorously rational-logical and linear. The interplay between divergent and convergent thinking influences the invention efficiency considerably. The invention efficiency is the ratio of marketed inventions to the total number of inventions. Trainings with a focus on alternating between the two ways of thinking are beneficial to identify and implement business ideas (Basadur et al., 1982; Wolf and Mieg, 2010).

In 2009, Greiner et al. invited 1200 managers to participate in a survey, which aimed to gain insights into the innovation process of german companies. The choice of the target group fell on the second-level management, because they have a realistic assessment of the innovation management and knowledge about the strengths and weaknesses of the system. The study shows, that creativity techniques are used only to a small extent (22%) and that companies do not possess specific knowledge (91%) and often do not deal with creativity support. A lot of potential, with respect to the idea generation is untapped and companies with a significantly higher business success have a higher degree of innovation. However, the successful companies are increasingly using creative techniques to meet the need for a creative idea generation process (Greiner et al., 2009). A study by Kirchgeorg et al. (2010), shows that with the help of new products and services that have been produced with innovation processes, twice as much revenue can be generated. The practice of many companies, thus, shows that only a few make use of creativity support techniques. Approximately 70% of the less successful companies stated that they have not used creativity techniques in recent years, whereby possibilities of competitive advantage were not fully exploited (Kirchgeorg et al., 2010). With these creativity techniques, companies can involve all employees, dismantle their mental barriers, support critical thinking and hence develop new and innovative ideas. In the study, it became clear, that only about 20% of all companies involved creativity support in workshops and meetings and that only 9% of the employees have specific knowledge about creativity techniques. The study additionally states, that brainstorming is still the most widespread creativity techniques (Kirchgeorg et al., 2010). In a study by Gielnik et al. (2012) the full use of creativity techniques in entrepreneurship was presented. The study examines the fact that entrepreneurs should not only focus on their field of expertise, but should acquire interdisciplinary knowledge from various disciplines in order to enhance creativity (Gielnik et al., 2012). This shows that a specialization cannot cause an increase in creativity. Creativity depends on contextual factors. The overlap of the two shown above constructs, suggests that a higher creativity leads to more entrepreneurship. However, an interactional perspective in the study of the relationship between creativity and entrepreneurship is needed. In order to better understand the impact of creativity on entre-

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Entrepreneurship it is necessary to constitute the entrepreneurial process in detail and highlight the possible influence of creativity support. In summon, it can be said that the potential of creativity techniques is not fully exhausted, whether in existing companies or start-ups and that a targeted use of creativity techniques should be applied.

Unlike existing companies, start-ups obtain many specific conditions and characteristics. This refers to, among other things, the ability to react quickly to changing environmental conditions due to a flexible corporate structure, non-existent liabilities (eg the prevailing image) and any existing corporate culture (Gilad, 1984; McMullen and Shepherd, 2006; Shane, 2003). In every business, whether start-up or established company, four phases of innovation are executed. These phases are broken down into the problem clarification, idea generation, idea selection and ultimately the implementation of decisions (Bullinger, 2008). Gielnik stresses the importance of the division of entrepreneurial processes into individual phases, in order to investigate the influence of creativity on entrepreneurship better (Gielnik, 2013). Only through this segmentation of the entrepreneurial process, the influence of creativity can be worked out in detail (Gielnik et al., 2012). Entrepreneurship designs itself as a process that consists of three different phases; identification of business opportunities, acquisition of resources, business profitability and growth (Baron and Shane, 2007). We focus on the first phase of the entrepreneurship process, the identification of business opportunities, where start-ups have a significant advantage, since they can integrate creativity support from the beginning and do not need to change any existing structures. An easier implementation of creativity techniques into early stages can support an idea and enhance the main business model.

3 Method

In order to further understand the relationship between creativity and entrepreneurship, the influence of creativity support and creativity support systems, we conducted a selective exploratory survey with 16 entrepreneurs. We strived towards a deeper understanding of the two constructs and tried to identify a link between CSS and entrepreneurial activities. In addition, we studied, whether IT support is used during entrepreneurial activities and whether IT can influence the creative process. Furthermore we sought to gain insights about the ideation process of entrepreneurs and how an idea is shaped into a business model. This includes insights about how many people were involved in the idea finding process and to what extend IT was used. We developed a survey, which was completed by all 16 participants. The survey had several continues questions, that build on each other. Thus, not every participant answered every item. The complete survey and the data are attached to the paper. With our findings we attempt to provide valuable information to entrepreneurs, who consider using creativity support techniques and CSS to enhance their creative process and improve their overall business.

3.1 Participants

We selected 16 german entrepreneurs, who either are currently involved in entrepreneurial activities or were involved in the past in a start-up. Our participants were intentionally selected by their qualifications and by the branch of industry of the start-up. We asked for participants in special start-up communities and were provided with additional contacts by the institute of entrepreneurship of our university. Additional, we selected start-ups from various stages of their business up to long-time running businesses. We thus, collected data from 11 different branches of industries, including technology, engineering, education, fashion, mobility and finance. The participants were between the ages of 20 and 59, whereas the majority (12) were between 20 and 39. Four entrepreneurs are female and 12 are male, with ten of them working full-time for their start-up, two half-time working, three entrepreneurs are currently doing a higher education beside their entrepreneurial activities and one currently marginally employed (not in the start-up company). Ten participants already hold a higher education degree.
(Bachelor, Master or Ph.D.) and two hold a technical education, one does not hold an education and two did not specify their graduation.

3.2 Measures

With our survey we aimed to gain a deeper understanding, if entrepreneurs make use of creativity techniques and if they use tools to support creativity. Our goal was to identify relationships between the use of IT and creativity support and the branch of industry, the start-up phases, the perceived influence of IT and creativity support on the business idea and the business model. In addition we tried to gain general insights about the ideation process of start-ups and how this process differs from literature. Cherry and Latulipe (2014) approached a way to measure how well a CSS enhances creativity and developed a Creativity Support Index (CSI). The CSI measures six dimensions of creativity support tools and evaluates the effectiveness of the tool. We did not intend to evaluate the effectiveness of CSS in general, but the influence of CSS on entrepreneurial activities. Therefore we selected three of the dimension to evaluate, whether the use of the CSS was able to enhance the overall idea (Exploration), the worthiness of the tool (Results Worth Effort) and the collaboration support (Collaboration). In addition, we intended to specifically identify actual creativity support techniques and systems that have been used (Cherry and Latulipe, 2014).

We generated five main domains with overall 31 items. The items contain fixed questions and open questions. Table 1 gives an overview of the domains, the number of items and the intention of the items.

<table>
<thead>
<tr>
<th>Domain</th>
<th>Items</th>
<th>Description</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td>4</td>
<td>Information about the age, income situation and education.</td>
<td>Identify relations between the use of IT, the age and education.</td>
</tr>
<tr>
<td>Start-up information</td>
<td>3</td>
<td>Information about the type, field, and stage of the start-up.</td>
<td>Basic information about the start-up to identify relations between the type, branch, and phase of the start-up and the ideation</td>
</tr>
<tr>
<td>Idea generation and external influence</td>
<td>5</td>
<td>Information about the initial idea, the process of idea generation, the involved people, the external influence.</td>
<td>How did the idea evolve and if the idea was influenced by external information.</td>
</tr>
<tr>
<td>Creativity techniques</td>
<td>4</td>
<td>If creativity techniques were applied and in what stage.</td>
<td>Did the influence come from creativity techniques and which specific techniques were used.</td>
</tr>
<tr>
<td>IT and creativity support systems</td>
<td>15</td>
<td>If IT was used to support the ideation process and if special creativity support systems were used.</td>
<td>Relations between demographics, entrepreneurial phases and external influence.</td>
</tr>
</tbody>
</table>

Table 1. Measures of the conducted survey

3.3 Results

The 16 entrepreneurs were mainly working in a leading role, e.g. founder and management, with additional activities. This is due to the fact, that all of the start-ups have a low number of employees and the entrepreneurs are involved in all main activities. Thus, additionally working details like fund rais-
ing, IT development, financing and product development were specified. The overall 11 branches of industries are mainly IT-based (seven start-ups), followed by three engineering start-ups. The majority (12) of the ideas, responsible for the business model, originated from a problem, a question, a wish for a product or service or the need for an improvement. After the participant’s own perception, only three ideas originated from an independent creative thought. One participant could not specify the idea orig-
ination. On average, 2.2 people were involved into the idea generation, with a peak of four involved people (once). Eleven entrepreneurs stated that their ideas were influenced by external sources, like Internet databases, research, journals, print articles and creativity techniques. Ten stated, that the idea was enhanced due to the influence. One participant did not know if it changed. However, only six of them knowingly used creativity techniques, whereas Brainstorming, Brainwriting and Mind Mapping were used by three of them. Methods like World Café, SCAMPER, Walt-Disney and Design Thinking were respectively only used, whereas one entrepreneur combined two of those methods. One entrepre-
neur could not give a name of the used creativity technique. Five entrepreneurs used creativity techniques during the pre-seed and seed stage, whereas one entrepreneur continuously used creativity technique through all stages (pre-seed, seed, start-up and 1st stage). Four of the entrepreneurs additionally used IT during the idea generation, whereas three of who used actual CSS, like Microsoft Visio, mind-mapping tools, digital whiteboards, IdeaCloud by IdeaCloud Ltd. and brainwriting tools.

Three of the participants using CSS stated that, the use of the systems were helpful and enhanced the overall quality of the idea, the system was worth the purchase and will be used in the future, the sys-
tem was intuitive and easy to use and that collaboration was enhanced. The entrepreneurs, who used creativity techniques, but did not explicitly use CSS, stated also, that the idea was enhanced. Entrepre-
neurs, who did not use creativity techniques stated, that certain techniques could not have been applied to their task, are considered as useless or were not familiar with any techniques. All of those stated, that they do not know the advantages of creativity techniques or of CSS. Table 2 gives a brief over-
view of the results. The complete survey and the results are additionally attached to the paper.

<table>
<thead>
<tr>
<th>Question</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was your idea influenced by external information?</td>
<td>Yes [11], No [5]</td>
</tr>
<tr>
<td>→ How and by what/who was your idea influenced? (Multiple answers allowed)</td>
<td>Friends, colleagues, other people [8], Internet [10], other [2], literature, magazines and journals [5], Fashion stores and second hand stores [1]</td>
</tr>
<tr>
<td>→ Has your idea changed/developed by the external influence?</td>
<td>Yes [10], Don’t know [1]</td>
</tr>
<tr>
<td>Did you purposely use creative techniques during any stage of your start-up?</td>
<td>Yes [6], Don’t know [3], No [7]</td>
</tr>
<tr>
<td>Did you use any kind of IT-support during idea generation?</td>
<td>Yes [5], No [11]</td>
</tr>
<tr>
<td>→ Did you use any creativity support system?</td>
<td>Yes [4], No [12]</td>
</tr>
<tr>
<td>• Which one(s) did you use? What kind of CSS?</td>
<td>Mind mapping tools, digital whiteboards, visio, Ideacloud, brainwriting</td>
</tr>
<tr>
<td>• How much does (or did) the system influence the creativity process?</td>
<td>Very much [1], much [2], medium [1], low [0], very low [0]</td>
</tr>
<tr>
<td>• How much do you think did the use of the system improve the quality of the idea?</td>
<td>Very much [1], much [2], medium [1], low [0], very low [0]</td>
</tr>
</tbody>
</table>
Moreover additional comments were given, that it is often better not to use creativity techniques, as with their use, often more and even too many ideas were produced, leading to an idea overload and imprecise business models. Specific information about creativity techniques and especially CSS are often not given, thus the advantages are not know. Additionally it is unclear, which technique would fit to which task and what specific system could be beneficial. One entrepreneur also stated, that certain CSS are currently to expensive and not worth the use. In the following section we discuss the results and present interesting relations.

### Table 2. Brief overview of the results without demographic data and start-up information

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>• How much do you think did the use of the system supported the creativity?</td>
<td>Very much [1], much [2], medium [1], low [0], very low [0]</td>
</tr>
<tr>
<td>• It was easy to generate many ideas through the use of the system.</td>
<td>Strongly agree [0], agree [3], neither agree nor disagree [1], disagree [0], strongly disagree [0]</td>
</tr>
<tr>
<td>• The intuitiveness of the system was very high, so that the concentration could be drawn to the activity and not on the tool</td>
<td>Yes [3], Don’t know [1], No [0]</td>
</tr>
<tr>
<td>• How do you assess the long-term acceptance of the tool in the business?</td>
<td>Very high [0], high [3], medium [0], low [1], very low [0]</td>
</tr>
<tr>
<td>• Do you think that you and/or your employees need further training on using CSS?</td>
<td>Yes [3], Don’t know [0], No [1]</td>
</tr>
<tr>
<td>• The exchange of ideas in the team is facilitated by the use of the CSS</td>
<td>Strongly agree [0], agree [3], medium [0], disagree [1], strongly disagree low [0]</td>
</tr>
<tr>
<td>• How do you assess the importance of CSS for entrepreneurs?</td>
<td>Very important [3], important [0], medium [1], not important [0], not important at all [0]</td>
</tr>
<tr>
<td>• Is it worth it to invest in CSS?</td>
<td>Yes [3], No [1]</td>
</tr>
</tbody>
</table>

4 Discussion and Outlook

Our selective study has shown, that the lack, stated by current research, of using creativity techniques and CSS during entrepreneurial activities, exists. Only six of our 16 entrepreneurs used creativity techniques and only four of them knowingly used CSS, even so the majority stated that the initial idea was positively influenced by external sources. One of the entrepreneur, who used creativity techniques stated, that he would have used CSS, if they would be more affordable. Additionally, every participant, that did not use creativity techniques is not aware of the advantages and does not know applicable techniques, not to mention the awareness of actual tools that support creativity. Entrepreneurs that did not use CSS, did not use general supporting information technology neither. This could implicate that technology affine start-ups would use CSS more often, however only two out of the four entrepreneurs, that used CSS, are working in an IT-based start-up. The other two start-ups, using CSS, are located in the fashion industry and engineering industry. An interesting relation can be seen between the education of the entrepreneurs and the usage of CSS. Every entrepreneur that used CSS, has a higher education. This could implicate that the entrepreneurs had knowledge about certain creativity techniques and tools due to their higher education. The age of the entrepreneurs using CSS is generally even. Three are between 20 and 29 and three entrepreneurs, using creativity techniques are between 30 and 39. Every entrepreneur, older than 39 (4), did not use information technology to support creativity and neither did not use creativity techniques. The majority of the entrepreneurs stated, that the original idea was influenced by external sources. A purposeful influence by creativity techniques or CSS could
thus additionally enhance the creative outcome. Various CSS make use of external stimulation by giving additional information to enable mental leaps and to open new frames to the idea generator. This leads to enhanced ideas and consequently to beneficial innovations. The majority of the ideas originating from a group creativity process, as at least two people were involved. These findings confirm the study by Ko and Butler (2007), who identified social networks and the interaction as a main influence on the idea. Therefore group creativity support systems, aimed to support the collaborative idea generation, could enhance the process in addition. The open questions generated additional valuable insights. Two entrepreneurs stated, that they know the benefits of CSS, but do not know specific CSS that would help with their particular product. In addition one entrepreneur stated, that the usage of a CSS would lead to an inefficient creativity process and would cause distraction during idea generation. This is clearly a lack of information, as different CSS are focused of convergent creativity process, that support the deriving and focusing on one idea in order to come up with a single and well-established idea. A major insight by the survey is on the one hand the identified lack of information about creativity techniques and CSS and especially the awareness of the benefits. One participants stated, that the use of creativity techniques and CSS can lead to imprecise ideas and a high amount of ideas, which can be counterproductive to build a business model. However, many techniques and CSS exist, that specially support the convergent process of idea generation to rigorous break down an unfinished and unworkable idea to an effective idea (Smith, 1998; VanGundy, 1992). On the other hand, the survey showed that entrepreneurs that use CSS receive highly beneficial results and intend to continue the use of CSS. However, our survey has a major limitation. The number of participants does not allow for generalization, even though it demonstrates the lack of knowledge in various fields of start-ups and especially highlights the lack of knowledge in the older generation of entrepreneurs. It can be said, that the advantages of creativity techniques and CSS are vast. Theory and practice shows that, creativity support can lead to highly beneficial innovations, which bring competitive advantages. With our study and literature review we draw implications for practice and research. Companies and especially start-ups should consider using creativity techniques and CSS to support the idea generation phase to improve their overall business model. However, the proper usage and the correct technique and system should be used, which includes a comprehensive education about creativity and creativity support. Additional to that, the IT structure should allow the usage of CSS, which, as stated, is easier applicable for start-ups than for existing companies. Different CSS can be tested and used, in order to fulfill the specific needs and characteristics of the entrepreneurial activities. Additional research should be done in order to representatively evaluate the impact of CSS on entrepreneurial activities and business success. In addition, specific CSS should be pointed out, that support special domains and tasks. Further insights on the start-up phases could support entrepreneurs, when it is especially important to use CSS. In summary it can be said, that our study and literature review point out the importance of support by information technology to enhance creativity. However, further and representative studies should be conducted to validate our findings.

References


Attachment: Survey

<table>
<thead>
<tr>
<th>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</th>
<th>Question</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</td>
<td>What is your age?</td>
<td>20-29 [7], 30-39 [5], 40-49 [2], 50-59 [2]</td>
</tr>
<tr>
<td>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</td>
<td>What is your gender?</td>
<td>Male [12], Female [4]</td>
</tr>
<tr>
<td>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</td>
<td>What career diplomas do you have?</td>
<td></td>
</tr>
<tr>
<td>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</td>
<td>Were you influenced by external information?</td>
<td></td>
</tr>
<tr>
<td>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</td>
<td>At what stage is your start-up?</td>
<td></td>
</tr>
<tr>
<td>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</td>
<td>In what industry is your start-up active?</td>
<td></td>
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<td>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</td>
<td>What is your role in the start-up? (Multiple answers allowed)</td>
<td></td>
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<td>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</td>
<td>How did your (companies) main idea evolve?</td>
<td></td>
</tr>
<tr>
<td>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</td>
<td>How many people were involved in the discovery of the basic idea?</td>
<td></td>
</tr>
<tr>
<td>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</td>
<td>Was your idea influenced by external information?</td>
<td></td>
</tr>
<tr>
<td>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</td>
<td>Did you purposely use creative techniques during any phase of your start-up?</td>
<td></td>
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<td>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</td>
<td>Did you use any kind of IT support during idea generation?</td>
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<tr>
<td>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</td>
<td>What is the exchange of ideas in the team facilitated by the use of the CSS?</td>
<td></td>
</tr>
<tr>
<td>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</td>
<td>Do you think that you and/or your employees need further training on using CSS?</td>
<td></td>
</tr>
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<td>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</td>
<td>How do you assess the importance of CSS for entrepreneurs?</td>
<td></td>
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<td>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</td>
<td>Is it worth to invest in CSS?</td>
<td></td>
</tr>
<tr>
<td>#1 Demographics, #2 Start-up information, #3 Idea generation and external influence, #4 Creativity techniques, #5 IT and CSS</td>
<td>Are you planning on using CSS in the future?</td>
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<td>Do you know the benefits of CSS?</td>
<td></td>
</tr>
</tbody>
</table>

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**Question:** Do you know the benefits of CSS?

**Results:** Yes [3], No [1]

**Question:** Are you planning on using CSS in the future?

**Results:** Yes [3], No [1]

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**Question:** Are you planning on using CSS in the future?

**Results:** Yes [3], No [1]

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**Question:** What are the benefits of CSS?

**Results:**
- Yes [3], No [1]
- Are you planning on using CSS in the future? Yes [3], No [1]
- Do you know the benefits of CSS? Yes [3], No [1]

---

**Question:** What is your role in the start-up? (Multiple answers allowed)

**Results:**
- Knowledge management [1]
- Fundraising, finance [2]
- CEO, Founder, Leader, Management, Human Resources [9]
- IT-Development, Web and print design [3]
- Product development and technology [2]
- Founder, product development, trainer [1]
- Executive partner [1]
- Brand communication, marketing [1]

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**Question:** How did your (companies) main idea evolve?

**Results:**
- From a problem/issue (e.g. "for problem X is no solution") [7]
- From a desire for a product/service ("Something there should be") [5]
- From a wish to improve something ("That should be better, easier, cheaper") [2]
- Unaffected from anything. Originated from a creative thought [1]
- I do not know anymore [1]

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**Question:** How do you assess the Intuitiveness of the system?

**Results:**
- Strongly agree [0], agree [3], neither agree nor disagree [1], disagree [0], strongly disagree [0]
- The intuitiveness of the system was very high, so that the concentration could be drawn to the activity and not on the tool [1]

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**Question:** At what stage have you used one of the techniques mentioned above? (Multiple answers allowed)

**Results:**
- Orientation stage (pre-seed) [4]
- Planning stage (Seed) [5]
- Foundation stage (Startup) [2]

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**Question:** In what industry is your start-up active?

**Results:**
- Construction industry [2]
- Gambling [1]
- Adult consumer products [1]
- Fashion [2]
- IT consulting [1]
- Automotive industry, electric mobility [1]
- Venture industry [1]
- Language learning, coaching [1]
- Consulting [1]
- Fasion / Cosmetics [1]

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- Unaffected from anything. Originated from a creative thought [1]
- I do not know anymore [1]

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**Question:** What are the benefits of CSS?

**Results:**
- Yes [3], No [1]
- Are you planning on using CSS in the future? Yes [3], No [1]
- Do you know the benefits of CSS? Yes [3], No [1]