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IDEA²MARKET: IMPLEMENTING AN IDEATION GUIDE FOR PRODUCT DESIGN EDUCATION AND INNOVATION

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ABSTRACT
As current design students will be potential moderators for future design ideation sessions, the research focused on an ideation guide to support them in executing these sessions. Nowadays, mapping the number of tools onto the logic of the innovation process gives an overload of possibilities and reveals the following important difficulties: (i) which tools should be used in each specific situation, and (ii) how to implement the possible tools in the right manner. This research also focuses on the success factors and the conditions to deploy supporting tools in a given innovation process in order to obtain a higher success rate in generating ideas and obtaining the necessary buy-in for it. The arguments are based on literature research and a series of five workshops with experts from academia and industry. In the first part of the paper, the key problems in the use and implementation are brought to light. The second part of the paper focuses on possible solutions for these key problems and results in a moderator guide supporting the ideation process. We hypothesize that design students will be more effective and efficient in creating output with an ideation session supported by the Idea2Market guiding box. The third part of the paper gives evidence of the possibilities of the Idea2Market instruction manual; by describing a test with students. The output of the students supported by the instructions was clearly higher than the results of a control group which was not supported by specific instructions.

Keywords: Innovation process, product design, ideation and moderator support

1 INTRODUCTION

Our research started from the idea to reduce the time to market in the context of innovation. In the process of product development, the focus is on how to control the ideation phase. We hypothesize that a better structuring and controlling methodology can lead to a better product, a shorter time to market and a higher firm success in general. Ideation is recognized as an important step in the innovation process. Having an efficient and effective approach in these early steps in the product development process has a big impact on the success of innovation [12]. Meanwhile, this phase is known by industry as a complex and hardly controlled process that is context-dependent. Most organizations lack the talent to find fresh and marketable ideas in the fuzz, because this stage is poorly understood [14]. The research focuses on how to give people the advantage to become moderators, who can organize and support these ideations sessions and consequently stress the importance of it in industry. The methodology is especially developed to support design students in acquiring this quality, and was studied from an academic context consulting industrial expertise to re-create the environment outside of the office. Certainly at the start, there was a need to reason in detail about the actual problems in ideation. Therefore triangulation was used in the research to investigate the problem domain from different angles. Both literature research and expert sessions have been executed to explore the problem and find opportunities to increase the efficiency and effectiveness of ideations. Concluding upon these findings, we identified several knowledge gaps and constraints. Converting these insights into a possible added value for our students, the Idea2Market guide was created.

2 LITERATURE STUDY

In the front-end of innovation, we observed four phases within ideation: (i) problem definition, (ii) generation of new ideas, (iii) selection of ideas, and (iv) investigation of feasibility and implementation before starting the development [4]. As mentioned in the introduction, the execution of these activities has a large impact on the success of the product but is still considered to be complex and fuzzy. Within our literature research, we started with an investigation of the existing tools and supporting methods which were developed to ease and structure the process of ideation. We evaluated the employability of each tool in the different phases of ideation in order to organize them. We also considered the critical success factors that are specific to the process of ideation.

2.1 Tools

Exploring the internet and literature, we could find an almost infinite number of tools, of which each provides specific support in the innovation process. We evaluated hundreds of tools by first dividing them according to the phase in which they support the ideation. In each of these phases we could identify different subcategories:

Tools for problem definition

Tools for problem definition can be used to define the problem in detail before starting the idea generation. The objective of the tools is to get a clear output of the definition to avoid misunderstanding between the participants. In this group of tools for problem definition, we could identify the following subcategories: (i) inspiration tools, (ii) descriptive tools, and (iii) explorative tools. Tools for inspiration provide the participants with other sources for ideas or for clarification and setting the boundaries. Examples of these tools are trend analysis [9], Google patents [10], and value analysis [15,19]. Descriptive tools support the paraphrasing of the problem definition. Examples of such tools are storyboarding [15,19], mind mapping [6,15], and the use of flowcharts [3,11]. Lastly, explorative tools support the exploration, deepening, and clarification of the problem. We identified five subcategories there: (a) higher level abstraction tools, (b) lower level abstraction tools, (c) checklist tools, (d) ideal situation tools, and (e) analytic tools. Co-creations [2,20], why-questioning [17], and chunking [19] are examples of exploration tools.

Tools for idea generation

Obviously, the idea generation tools support the generation of ideas. As a main difference between the tools, we found techniques to execute idea generation sessions on the one hand and stimulating tools to assist and enrich the idea generation by stimulating alternative and creative thinking, on the other hand. Techniques for idea generation are the most popular, examples are brainstorming, brainwriting, and creative collaboration technique [3,1]. Stimulation tools to find alternatives are tools that force participants to approach the problem from a different angle with the aim to find atypical solutions. Scamper [5,6,15], triggering [1], and biomimicry [11] are examples of such tools. Tools that stimulate creative thinking fuel the thinking process, without supporting the content of the sessions. Often stimuli with pictures, sounds or music, and video are used.

Tools for evaluation and selection

These tools support the decision making process, evaluating and selecting the generated ideas. On the one hand tools that support evaluation and ranking of the results, both in a quantitative and in a qualitative manner, were found. Tools for quantitative evaluation and ranking are house of quality [2,17], and trade-off evaluation [3,1], while SWOT-analysis [3,11] and COCD-box [5,6] can be seen as tools for qualitative evaluation and ranking. And on the other hand multiple tools were found that use the technique of voting, for example the 100$ test [19], sticking dots [17], and negative selection [19].

Tools for implementation

These tools should support the implementation. The main goal of the phase is to get other people to buy into your idea, to get the idea accepted by the internal and external client. We identified two different groups, tools that use the participants to motivate and convince the buyer, such as negative brainstorming [6,17] and the adoption checklist [17]; and tools that can be used to present and show the idea, such as value chains [18,21], storyboards, quick designs and other visuals.

Umbrella tools

In addition to the tools that can be divided according to the phases, there are also many tools which cover all or multiple phases to guide the ideation. A comparison was made of several umbrella tools

[13] according to the following categories: Support in the different ideation phases, support inspiration, support of the process, and support of the moderator. As a conclusion, we did not find a tool that entirely supports all above mentioned categories.

2.2 Success factors

There are many factors that influence the success and failure of an idea and have already been repeatedly investigated and grouped in several categories, [7] illustrated in the below categories, each with a clarifying example.

A first category is *contextual* (e.g. analyzing customer requirements and drawing conclusions from results in test markets), a second holds *strategic* factors (e.g. companies that develop products when they don't have the experience, capacity or the right resources), a third set of factors are *product-related* (e.g. the clarity of the product definition leads to better product features, functions, target market segments, design requirements, product quality, …) and the last two categories - both organizational - are related to the *project environment* (e.g. product development projects with high priority regularly suffer from the fact that key figures in the organization have to spilt their capacity across multiple projects) and the factors inherent to the *adopted methods throughout a project* (e.g. the importance of including the appropriate use of tools in the ideation).

In each of the above categories we identified success factors relevant to ideation and distinguished the following clusters: (i) assets and competences, (ii) communication, (iii) competition, (iv) control, (v) culture, (vi) management, (vii) market, (viii) innovation novelty, (ix) product, (x) structure, (xi) project, (xii) technology, (xiii) time, and (xiv) relationships. Parallel expert research reduced the results to the factors directly affecting a specific phase of the ideation process and suggested an integration into a low threshold moderator guide, supporting the ideation process.

3 EXPERT RESEARCH

A series of five workshops with experts from academia and industry was organized. The workshops were organized as hands-on sessions examining every specific problem from a very pragmatic perspective. In each session four experts with different industrial backgrounds (large and small companies, innovation approach, organization of ideation) participated together with two experts from a design education context. We considered the latter as equally important, since organizing and executing ideations should be imbedded in the future task of design students who are trained for industrial jobs. Each of the experts was consolidated during a first exploratory interview to find pitfalls, knowledge gaps and other problems that are important during their ideation sessions. The conclusions immediately brought up some interesting aspects: they said that everyone is able to generate ideas, but hardly a few get so far as the following step. Evaluation, selection and implementation of ideas are important steps to be able to go further with the ideas. Moreover, they said that most of the time ideations are organised without any formal methodology. As a next step, we observed the experts during an ideation session in their industrial context, with the objective to identify difficulties and opportunities. Inspired by these observations, five creative workshops were organised to discuss cases and deepen the problem domain. As a result of these sessions several groups of knowledge gaps and obstacles were identified:

Storytelling - being seen

The experts concluded that one of the major difficulties is to get the idea through the hierarchical structure of the company. A first important reason is the limited form and maturity of the output of an ideation session, and a second one is that after some time the ideas become mediocre due to management involvement.

Assets & Competences - stage gate requirements

Grasping the output of a traditional brainstorm is mentioned to be difficult by the experts. They commented the following during the interviews and workshops: "How valuable is the idea? Can we warm up the business line for it? What's in it for the company in terms of margin, sales, logistics, market, etc.? Can we make it more predictability, measurable, verifiable and does it have business relevance? Can we describe the market feasibility with respect to possible business potential, differential advantage and risks? What's in it for the customer? What advantage does it offer?"

Buy-in - commitment

Assembling a dedicated team for a specific amount of time and maintaining a good communication within and outside the team is another crucial aspect. Again some remarks arose: "How to involve hierarchical superiors, people from other business lines or even outside the company in the early stages of a research project? How to increase the fan base in the company?

Facilitating – process management

A team leader has few means to manage, coach and intervene in the process of ideation and still a large amount of responsibility lays in his hands (trigger the group, organize the whole and coordinate actions between departments), while there is no guarantee on the team long-term capital, any form of feedback or a good design brief.

Selection & evaluation

"Ideation is more than just brainstorming, using many sticky notes and dumping them in a closet, clearly nothing will happen." Frequently due to an unclear problem definition, companies have more difficulties with converging rather than with the creation of ideas. Comments point out that the selection of ideas are too little formalized to be taken seriously, seldom there are objective criteria set to select, evaluate and follow-up those ideas.

Realization - doing instead of saying

What tells you more, the metaphor or the prototype. Usually the realization principle is missing, which is needed to give energy to the next design.

4 CONCLUDING ABOUT THE CONCRETE PROBLEMS

To close the triangulated explorative research actions, we considered the conclusions distance of the results of both the literature study and experts sessions. In general, there results were rather similar and were complementary in some parts. To conclude these exploratory research activities, we can use the following quote of one of the experts: "there are simply too many tools, which implies that, generally, people do not know how to proceed an ideation successfully". This is mainly because structure and guidance through the different phases are missing. This implies that peoples are not aware of the different phases that should be identified and completed, which tools can be implemented at which moment in time, what information is needed, who should be invited, which pitfalls can be avoid, etc.

5 I2M BOX

During the research we considered possible solutions for the above mentioned key problems. This resulted in an instruction manual to support the moderator of the idea generation process.

The Idea2Market guiding box or, in short, I2M box, focuses on the four phases of ideation and introduces a fifth preliminary phase to prepare and structure the ideation. The efficiency and effectiveness of the ideation will increase due to the support in the organisation and execution of the ideation. As shown in Figure 1, the guide is realised as a box containing a moderator guide, a bundle of carefully selected tools, a process board and extra creativity supporting roles. Each part tackling corresponding problems and guiding both moderator and participants according to their experience level. The moderator guide reduced problems regarding the organisation of an ideation session and introduces a new preliminary phase, the 'pre-shoot'. The guide supports the moderator through the process of ideation and explains his tasks and those of the team. In addition, it indicates the critical constraints and conditions to succeed. The bundle of tools facilitates the moderator to find the appropriate tools in the mass of available tools. As told before, each tool can be applied in different process steps and supports different innovation activities: analysis, synthesis, decision-making and simulation activities. Mapping these tools onto the logic of the innovation process gives an overload on possibilities and reveals the most important difficulty and opportunity at the same time: what tools should be used in a specific situation and how to implement the possible tools. A process board was provided as an extra accessory to help the moderator following a predefined structure, but is also helpful for participants to have an overview on the approach and the progress, it strengthens the methodological and structural approach of the ideation, it helps to set boundaries, and clarifies the time schedule through visualization. Lastly, role-play can be used in the ideation process to consider all problems during the problem definition, to expand the search field during idea generation, and to identify and to implement the ideas. Using this I2M box will improve the efficiency and chance of success through (i) supporting a good preparation of the ideation, (ii) implementation of the right tool at the right time, (iii) going through all phases of ideation, instead of just brainstorming, (iv) use of

extra roles to widen the search field, (v) bring awareness of the moderators tasks, and (vi) ranking of the most important creativity tools and boundary conditions.

Figure 1. I2M guiding box

6 FIRST VALIDATION

As a first validation, we tested the I2M guiding box with graduating students. Without going too much into detail - following the principles of the I2M guiding box - we facilitated an ideation session on the subject: *"Electrifying car brands: taking brands into consideration in the idea generation phase"*. Ten groups of six master students each had to add more visceral, behavioural and reflective experience (abstract attributes) to the brand (either Saab, BMW, Toyota) by means of concrete product attributes. The 10 groups were divided according to conditions: Five groups did a brainstorm as they were used to (free method), and five groups used the I2M guiding box. After clarifying the problem statement the divergent phase resulted in a number of items per group in a very short span of time. The I2M method groups generated more ideas (an average of 154) than the free method group (an average of 103). Moreover, the ideas of the I2M method group had a stronger connection with the problem statement, as concluded after the analyses by three experts. A second phase converged the items into original and workable features for the near future. These ideas were immediately categorized in a way that they could serve as valuable input for the design brief. More information about the objective and the purpose of this ideation can be found in [16]. The briefing of final ideas for product features of the I2M method groups were more accurate and specific than those of the other group. The free method groups ideas were still more at an abstract level (e.g. *grid that looks like the eyes of an insect, high technological features… eco labelling*). The other groups came up with more workable attributes (e.g. *blue light behind the grid so that it looks more technological, digital communication board at the back of the car that tells others that you drive ecological friendly, …)*. Afterwards the students filled out a questionnaire about their own experience concerning the exercise. Twelve items were rated on a 5 point Likert scale (*lead to useful ideas, easy to start, easy to generate ideas, clear how we should do it, enjoy doing it, easy to come to conclusions, easy to write a design briefing, working in group did go well, clear who was taking which role within the group, the problem was well defined, it was easy to be creative, it was easy to think in an unconventional way)*.

In general, the mean scores were higher for the I2M method group than for the free method group. This difference was significant ($p < 0.05$) for the two items measuring the easiness of idea generation (easy to start, easy to generate ideas) and for the item easy to write a design briefing ($p < 0.1$).

To elaborate on Fernandez's research [7] regarding the experience of teaching structured methods for innovation and product development in educational context, we seek to demonstrate the usefulness of systematic facilitating student projects and when applied correctly, enable more significant product concepts. The output of the team supported by the instructions was clearly higher than the results of a control group which had not received any specific instructions.

7 CONCLUSIONS AND FUTURE RESEARCH

The research shows an added value in improving the efficiency of the ideation process through following solutions. Firstly, the preliminary scoping of both the tool and the creative problem or opportunity raises the efficiency and effectiveness of the process. It gives the opportunity to anticipate on contingencies during the creative process. Secondly, the process needs a plan or layout that gives the opportunity to align the different process steps and to elaborate on prior results. In each step an overview of different existing applicable tools is required and different success and failure factors should be known. Thirdly, the approach needs a system with different levels according to the experience of the team involved. Working on a higher level could bring in the aspect of role playing. Roles add complexity but also the opportunity to look at each problem from different angles. The confrontation of these different angles might result in a higher quality of the outcome.
Future research and refinement, by experimenting in educational (and industrial) contexts, should focus on the improvement of moderator support through the implementation of the above mentioned solutions, using the I2M box, in the product design education and innovation context.

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