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A creative idea generation methodology by future envisioning from the user experience perspective

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ABSTRACT

Although several studies have suggested activities of the fuzzy front end (FFE), they focus more on incremental innovation than to radical innovation. This study developed a creative idea generation methodology for the FFE of radical innovation from the user experience (UX) perspective, i.e., UX-driven idea generation methodology. Based on a literature review, a creative idea generation process was developed; it consists of four successive phases (Future envision, Opportunity identification and analysis, Idea generation, and Idea expansion) and one supportive phase (Ideation control). From various research fields, 70 idea generation techniques were collected and classified into phases of the process. To identify implicit and latent opportunities, the future envision method was developed based on a factor combination approach. In assessments by four experts in IT, the ideas generated by the UX-driven idea generation methodology got higher scores than brainstorming approach in novelty and relevance, but not in feasibility. The effectiveness, efficiency, and satisfaction was greater in the group who used the UX-driven idea generation methodology.

Relevance to industry: The idea generation methodology suggested in this study can help indusial designers such as novice designers, analytical individuals as well as intuitive individuals who adhere to initial ideas. The UX-driven methodology can be used as a guideline when selecting an idea generation technique in the FFE.

1. Introduction

Successful innovation requires high-quality ideas (de Carvalho, 2009). Ideas are generated at a very early phase in the innovation process, the so-called “fuzzy front end” (FFE). The FFE has the largest effect on the innovation process and outcomes of the innovation, at relatively little time and cost. Many firms fail to manage the FFE in a satisfactory manner because they do not approach it systemically (Riel et al., 2013). Especially, effective generation of new ideas remains a challenge (Schulze and Hoegl, 2008).

From the human-centered design (HCD) perspective, radical innovation is a result of change in either technology or meaning (Norman and Verganti, 2014). Recently, several firms that have successfully achieved radical innovation have been emphasizing the role of user experience (UX). Firms that recently achieved great success in radical innovation did not primarily use market research data but took an intuitive approach to create a new feature of a product. The beginning of the radical innovation process entails development of solutions to unstructured problems, or exploitation of opportunities. Identifying methods to start idea generation might be the most challenging problem when firms desire radical innovation (Lee et al., 2001; Reid and de Brentani, 2004).

Intuitive individuals tend to process unfamiliar and unorganized information in a synthetic and holistic manner (Kickul et al., 2009). They may not prefer an elaborate framework that guides their thinking. Nevertheless, both experts and novices can tend to generate slight variations of their past solutions, because initial ideas or presented examples reduce the flexibility of these people to explore novel solutions (Viswanathan and Linsey, 2011). The systematic methodology can help intuitive individuals to discard fixations on initial ideas. Also, such frameworks can be preferred by analytical individuals who are likely to process information in a linear and sequential manner and by novice designers who aspire toward controlled and guided ideation (Biskjaer et al., 2010; Kickul et al., 2009).

The goal of this study was to develop a creative idea generation

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methodology for radical innovation of UX. Especially, this study suggested a novel way to start the FFE; i.e., how to identify implicit opportunities from UX perspectives. After developing an idea generation process, numerous idea generation techniques were collected and classified into phases of the process. To support scenario generation, three dimensions and parameters were defined. Finally, the suggested methodology was tested experimentally.

2. Approaches to creative idea generation

2.1. Procedural approach: creative problem solving

Designing a new product or service can be considered an ill-defined problem because the design task of innovation is often defined fuzzily without clear objectives (Reiter-Palmon and Illies, 2004). Especially during radical innovation, the goals are nonexistent or vaguely-stated, and the solution cannot be specified. Generation of radical ideas requires iterative and complex problem solving because of the uncertain problem and unclear outcomes (Florén and Frishammar, 2012). A typical and popular approach to solve ill-defined problems is creative problem solving (Puccio et al., 2006).

Many processes of creative problem solving include problem construction or problem definition as the first step. In the creative process, finding new and useful problems is considered to be more important than finding useful solutions (Basadur, 1991). Constructing problems in multiple ways has been shown to improve the success of creative problem solving (Illies and Reiter-Palmon, 2004). Experts spend a larger proportion of their time on problem-construction process than on other steps (Rostan, 1994). Also, the quality and originality of solutions increase with the time that innovators spend in formulating and analyzing a problem (Illies and Reiter-Palmon, 2004).

2.2. Ergonomic approach: prospective scenarios

The ergonomic approach has evolved from corrective ergonomics, through preventive ergonomics (Robert and Brangier, 2009), to prospective ergonomics. Initially, the main work in corrective ergonomics was started by a client's request to correct problems, incidents, or errors. In contrast, preventive ergonomics focuses on the artifact to be designed. Prospective ergonomics, the new paradigm, responds to the challenges of innovative design. Corrective and preventive ergonomics are closely related to incremental innovation; prospective ergonomics is closely related to radical innovation, i.e., creation of new products or services (Liem and Brangier, 2012).

Based on the paradigm of prospective ergonomics, Nelson et al. (2014) proposed a methodology that can be used during the early stages of innovation to generate prospective scenarios of future. Prospective scenarios can be used to anticipate the user's activities, needs, expectations, and responses to new products or services. Proposing prospective scenarios can be interpreted as creating new experiences and suggesting new interpretations of product meanings, with regard to radical innovation of UX. By simulating various contexts such as time and space, new meanings of the product can be investigated.

2.3. Cognitive approach: creative cognition

Researchers agree that the major component of creative thinking is metacognition, which is a combination of metacognitive knowledge (knowledge about cognition) and metacognitive regulation (control of cognition) (Clerc et al., 2014; Flavell, 1979). Metacognition has important functions in creative cognition such as planning, persistence, intuition, and insight (McCombs, 2001). It takes charge of setting goals, monitoring progress and adjusting strategies (Smith et al., 2003). These skills are crucial in creative cognition because knowledge about when to persist at or to abandon a difficult problem can critically influence successful creative thinking. Hargrove (2011) stressed the role of metacognitive skills while using idea generation techniques.

Another phenomenon that underlies creative cognition is design fixation, which is defined as an adherence to a set of ideas, and that blocks successful solution of a problem (Jansson and Smith, 1991). People tend to retrieve the familiar instance of a concept from memory, and therefore often come up with ideas that are similar to existing ideas (Nicholl and Mclellan, 2007). Numerous studies have revealed that awareness of fixation and efforts to avoid it can reduce its effects (e.g., Lane and Jensen, 1993). Fixation can be avoided by adopting systematic design methods (Crilly, 2015). For example, morphological analysis forces designers to disengage themselves from the initial ideas and to consider the problem from numerous aspects.

Structural connectedness means that existing ideas can be the seeds of new alternatives (Finke, 1996). Often, new ideas are structured by transformation of existing ideas, or by unintentional structuring tendencies. Smith (1998) listed some idea generation techniques that use previous ideas to trigger new ideas. For example, the SIL method allows each member to successively propose an idea and the group to integrate proposed ideas into one solution. Another method, design heuristics, yields a varied set of solutions by applying heuristics to established solutions (Yilmaz et al., 2010). For example, SCAMPER provides seven general guidelines such as substitute, adapt, and modify.

2.4. Pragmatic approach: idea generation techniques

Based on the view that creativity is not a unitary process, many techniques to enhance creativity have been developed; they range from pieces of advices to structured procedures (Smith, 1998). The techniques assist problem solvers or inventors to stimulate creative thinking, generate ideas, or expand the range of solutions considered (Herring et al., 2009; Lee and Chang, 2010). Kudrowitz and Wallace (2013) classified idea generation techniques according to the type of problem: free-form and structured. If a problem is free-form (or ill-structured), i.e., has a large number of solutions, free-form idea generation techniques such as brainstorming should be used. If a problem is structured, i.e., has well defined goals and an optimal solution, structured idea generation techniques such as TRIZ and inventive problem solving can be used. Free-form techniques are suitable for the early stages of the design process that need creative ideas; structured techniques are suitable for the advanced stages of the design process.

Previous attempts to apply idea generation techniques to the FFE left much room for several considerations. Initially, idea generation techniques were used without careful consideration of the type of innovation. Incremental innovation is based on the analysis of existing products or services, whereas radical innovation is devoted to create new artifacts with no reference products or services. Another problem is that most previous studies applied idea generation techniques to conceptual design, such as 'designing product attributes taking brands into consideration' (de Wit et al., 2012; Herring et al., 2009). Previous classifications of idea generation techniques indicate that some are best used to generate ideas and others are best used to generate concepts (Shah et al., 2000; Kudrowitz and Wallace, 2013). For example, TRIZ was originally designed to support incremental and technical innovation (Herstatt and Verworn, 2001), so TRIZ is not suited to idea generation of