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Effects of team cognition and constraint on new product ideation ☆

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ABSTRACT

Idea generation is a critical activity in new product development. This study investigates the effects of ideation team's cognitive depth (specialization) and breadth (diverse expertise) as well as goal constraint on the generation of new product ideas. Focusing on the determinants of new product idea development helps articulate the mechanisms to generate more useful and novel product ideas. The findings indicate that specialization and diverse expertise affect idea novelty directly, albeit differently. Goal constraint helps enhance the usefulness dimension of new product ideas, but has little effect on the newness dimension of the ideas. Finally, goal constraint helps harness the diverse expertise of the team toward a more useful idea.

1. Introduction

Organizations' ability to generate creative ideas is critical for new product success. The importance of new product ideas is underscored by the fact that the improvements in product ideation greatly influence the following new product development (NPD) stages (Montoya-Weiss & O'Driscoll, 2000; Toubia, 2006). Firms generally develop multiple product ideas in the front end (i.e., ideation stage) and retain only a few of these ideas for the subsequent phases (Girotra, Terwiesch, & Ulrich, 2010). In fact, Griffin (1997, p. 448) finds that "100 ideas lead to 15.2 successes." These evidences together suggest the crucial effects of product ideas on NPD success, and a recent best practice study (i.e., Barczak, Griffin, & Kahn, 2009) urges further knowledge improvement in idea management.

Against this backdrop, this study develops and tests a theoretical framework focusing on the ideation-related activities in a team setting — a commonly employed structure in NPD. Specifically, the study examines the effects of cognitive characteristics (depth and breadth) of the ideation teams on the ideation outcomes. The research further examines the boundary conditions anchored in the market or customer needs (or "goal constraint" see Stokes, 2006; Stokes & Fisher, 2005, p. 283) and its co-existence with the team's cognitive depth and breadth in order to better understand how these crucial factors affect idea generation.

While creativity of new product idea depends on the judgment of the NPD team and the target customers, this research focuses on the perceptions of the ideation team members. The rationale is that while customers may be good judges of new product concepts at a fairly advanced stage (e.g., prototype), they may find it difficult to assess the creativity of these ideas during the front end where the ideas are somewhat fuzzy. Customers may contribute by providing a peek into their needs and wants in an early NPD stage. The ultimate judgment, however, must be made by the ideation team, who may use customer-related information in the ideation process in the form of goal constraint. In sum, this study addresses two research issues, including (1) how team cognitive characteristics enhance/inhibit the ideation task outcomes, and (2) the mediating role of goal constraint on the relationship between an ideation team's cognitive characteristics and the ideation task outcomes. The theoretical framework, methodology, and findings follow.

2. Theoretical framework

Literature identifies domain-specific knowledge as one of the essential elements for creativity (Amabile, 1983; Mumford, Mobley, Uhlman, & Reiter-Palmon, 1991). In addition, Mumford and Gustafson (1988) hold that knowledge and experience play significant roles in creative and ideation activities. Creativity studies also suggest that a group or team is a productive setting allowing its members to generate creative ideas (Nijstad, Diehl, & Stroebe, 2003; Paulus, 2000). As a creative idea is a new association (e.g., Mednick, 1962), a team's collective knowledge would be directly related to its ideation task outcomes. More specifically, a creative idea is a new combination of cognitive elements that have been gathered and stored in the team. The more the team can aggregate

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cognitive elements, the more likely it can assemble new combinations, resulting in more innovative product ideas.

The aggregate set of cognitive components includes the team members' specialization in their domain as well as their diverse knowledge bases. While team members' knowledge (specialization) influences the ideation outcomes directly, the ideation team may have to go through some forms of integration or have a focus to maximize the benefit of this cross-functional setting to produce desirable ideas. One way to understand how this functionally diverse team operates is to follow an "input–process–outcome heuristic" (Lepine, Piccolo, Jackson, Mathieu, & Saul, 2008, p. 278), commonly used in cross-functional integration studies (e.g., Joshi & Sharma, 2004; Park, Lim, & Birnbaum-More, 2009; Slotegraaf & Atuahene-Gima, 2011). According to this heuristic, the integration condition or contextual boundary shapes the outcome. In an ideation context, the "bounded creativity" theory implies that constraint leads to creativity by specifying exploration boundary, limiting overly heuristic search, and providing a frame of reference to generate creative outcomes (Hoegl, Gibbert, & Mazursky, 2008, p. 1385–6). New product scholars acknowledge that constraint employed in NPD can lead to innovative outcomes (e.g., Goldenberg & Mazursky, 2000; Goldenberg, Mazursky, & Solomon, 1999). Thus, constraint creates the condition in which the teams can integrate their different expertise, stay focused, and produce more effective new ideas, and thus constraint acts as a mediator.

Finally, consistent with the existing literature (Amabile, 1983; Cooper, 1979; Im & Workman, 2004), this study takes the stance that novelty and usefulness are the two most important dimensions of new product ideas. Idea usefulness reflects the degree to which the product idea has potential to solve customers' problems, satisfies their needs, or becomes useful to them. Idea novelty represents the extent to which customers perceive that the idea is original.

2.1. Team member specialization and ideation outcomes

Although the amount of a team's cognitive elements is critical for ideation, a high level of specialization can have adverse effect on creativity. For instance, specialized innovators' highly committed mental models can cause errors or biases (Mumford, Blair, Dailey, Leritz, & Osburn, 2006). Based on their past experiences, specialists may stick to their tried and tested mental models. They may take a "cognitive shortcut" by oversimplifying and automating the innovation process (Hinds, 1999, p. 206). Specialists may also overlook novel ideas, ignore new information, and reduce efforts to seek alternate solutions (Mumford et al., 2006). Consistent with the curse of knowledge theory, the experts have a tendency to stick to their own cognitive resources and unsuccessfully envision other's views (Birch & Bloom, 2007; Gourville, 2005; Keysar, Ginzel, & Bazerman, 1995). These evidences suggest that a high level of team member specialization may in fact result in a tried and tested solution to the problem. Thus, *the ideation team made up of members having high levels of specialization will generate predictable, less novel but, useful product ideas*. Further, the team members having very high levels of specialization may be too comfortable with their own specialized knowledge to realize the usefulness of other's perspective (Birch & Bloom, 2007; Gourville, 2005; Keysar et al., 1995). These specialists may in fact ignore or be unaware of contextual boundary or constraints imposed by market factors — goal constraint. Thus, *the ideation team made up of members having high levels of specialization will not be aware of goal constraint*.

2.2. Team member diverse expertise, goal constraint, and ideation outcomes

Previous NPD studies have acknowledged the importance of cross-functional team (e.g., marketing, R&D, and engineering) and multiple domain-relevant knowledge bases and skills in developing new products (e.g., Carbonell & Rodriguez, 2006; Nakata, Im, Park, & Ha, 2006; Troy, Hirunyawipada, & Paswan, 2008). Studies on cognitive process in creative problem solving suggest that, after problem construction, individuals generally search for relevant information from the sources available to them, e.g., individuals' memory, external sources (Bink & Marsh, 2000; Mumford et al., 1991; Reiter-Palmon & Illies, 2004). Forming an ideation team with diverse expertise can increase information and knowledge sharing. In fact, a cross-functional setting enhances the tendency of shared information and knowledge (Joshi & Sharma, 2004; Park et al., 2009; Rodríguez, Pérez, & Gutiérrez, 2008). This sharing allows individual experts to access each other different knowledge domains, build new ideas upon other members' ideas, and reexamine each other approaches to the solutions. Team members from various functions may have different "thought world" (Brown & Eisenhardt, 1995, p. 357) and understand and define idea novelty and usefulness differently. This diverse knowledge within a cross-functional team may result in chaos, unless team members deliberately concentrate on the task at hand and create a bounded scope to focus on the area most relevant to the success of new products — i.e., customer needs. This customer or market-related constraint forms a loose boundary (relevance) in which the ideation team members can focus to increase variation (novelty) of new combinations (Hoegl et al., 2008; Stokes & Fisher, 2005). In keeping with Stokes and Fisher (2005, p. 283), this research labels this type of boundary condition as goal constraint.

Goal constraint encapsulates the "overall criteria" and "stylistic conventions" for a particular domain (Stokes & Fisher, 2005, p. 283). According to the constraint-creativity and team's input–process–outcome perspectives, this study holds that goal constraint can serve as a "transition process" — the mediated activity that allows the diverse expertise to affect ideation outcomes indirectly (Lepine et al., 2008, p. 276). Lack of diverse expertise would perhaps make the ideation team too focused on their specialization and not pay attention to the consumer-anchored goal constraints. Hence, *the ideation team made up of members with high levels of diverse expertise is likely to be very conscious of goal constraint when developing product ideas, i.e., diverse expertise is positively associated with perceived goal constraint.*

As goal constraint mediates the team diverse expertise-ideation outcome relationship, creativity of product ideas is probably enhanced by the increased constraint. Johnson-Laird (1988, p. 216) notes that "… the creator generates ideas making use of some initial constraints…" Relying on cognitive psychology perspective (e.g., Finke, Ward, & Smith, 1992), psychologist and new product scholars particularly propose that creativity demands a certain level of constraint in which ideation efforts can be focused to increase variation (Goldenberg & Mazursky, 2000; Stokes, 2006). Constraints can guide creators to increase variability by "precluding reliable, repetitive response and promoting unusual, unexpected ones" (Stokes, 2001, p. 355).

In a functionally diverse ideation team, goal constraint may prohibit the waste of cognitive efforts and non-creative association by inhibiting overly heuristic approach. While the creators attempt to convert the initial ideas to the final stage, they have to work their way through constraint (e.g., Klahr & Simon, 1999, p. 532). Ideation professionals search for available cognitive elements to form new combinations, and at the same time, incorporate goal constraint in the stimulus and reference set to enhance the relevancy of the combination. By being cognizant of goal constraint anchored in customer's perspective, the ideation team is able to generate useful and novel ideas from the perspective of the customers. Without this knowledge, idea developers may waste effort and resources chasing after ideas that seem novel only to the ideation team or are not useful to the customers. From this perspective, goal constraint helps locate possible new associations (novelty), and at the same time, assists creators to recognize the relevancy of the new combinations (usefulness). The inclusion of constraint imposed by the market becomes an essential part of the new combinations of cognitive elements. Several studies show that the advantages of incorporating customer views in NPD are valid (e.g., Fang, Palmatier, & Evans, 2008; Fuchs & Schreier, 2011). Thus, *the presence of goal constraint helps the ideation team use its diverse knowledge bases to generate novel and useful product ideas.*