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CREATIVE THOUGHT IN REAL - WORLD INNOVATION

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Abstract

Innovation, the implementation of new, original, useful ideas is viewed by many as the key to sustaining a competitive advantage (e.g., Dess & Pickens, 2000; Kuczmarski, 2003; Mumford & Hunter, 2005). By introducing new products and processes first - ahead of competitors - organizations are able to carve a substantial marketplace niche, oftentimes solidifying their role in a current business environment best characterized as turbulent, dynamic and rapidly changing. Moreover, organizational innovation provides companies with the tools to exist at the cusp of environmental shifts, allowing them to both stay ahead of and simultaneously shape the direction of business itself (Taggar, Sulsky, & MacDonald, in press).

*Keywords: I*novation, Creative thought

1. INTRODUCTION

Innovation, the implementation of new, original, useful ideas is viewed by many as the key to sustaining a competitive advantage [1,2,3]. By introducing new products and processes first - ahead of competitors - organizations are able to carve a substantial marketplace niche, oftentimes solidifying their role in a current business environment best characterized as turbulent, dynamic and rapidly changing. Moreover, organizational innovation provides companies with the tools to exist at the cusp of environmental shifts, allowing them to both stay ahead of and simultaneously shape the direction of business itself [4].

The implementation of new ideas, however, is one step removed from a particularly critical aspect of the innovation process. Specifically, before original ideas can be implemented at an organizational level, they must first be generated at the individual level. Put more precisely, substantial organi-

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zational resources as well as a willingness to use such resources are of minimal utility if an organization lacks ownership of creative ideas. This is not to say that the organization-wide implementation of original, new ideas is unimportant, or even less important than the cognitive generation of new ideas. Rather, the cognitive generation and exploration of novel ideas is a necessary, albeit not wholly sufficient, condition for organizational innovation.

2. EIGHT PROCESS MODEL OF CREATIVE THINKING

Due to the critical role of creative thinking in organizational innovation, a host of theoretical models have been developed to explain the processes involved [5,6]. Relatively recently, Mumford and colleagues [8] Reiter-Palmon, & Doares [10] and Mumford, Peterson, & Childs, [9] proposed an eight stage process model of creativity. Building off the work of Wallas [6], Dewey [7] as well as more recent conceptualizations such as the genoplore model [5], the researchers proposed that there are eight core processes involved in creative thought: (a) problem construction, (b) information gathering, (c) concept selection, (d) conceptual combination, (e) idea generation, (f) idea evaluation, (g) implementation planning and (h) monitoring. There is compelling evidence supporting the model and it is regarded by many as the most clear and comprehensive conceptualization of the creative process [10,11].

2.1. Problem construction

Before a new idea can be generated to solve a given problem the situation must first be clearly understood. What is critical to understanding creativity, however, is that the situations requiring the generation of creative solutions differ substantially from more straightforward, typical problem-solving scenarios. Specifically, situations requiring creative ideas tend to be complex and ill-defined [12,13]. As such, providing some structure - a framework for interpreting the problem - is critical to creative thought. Because problem construction is essentially the initial stage of cognitive idea generation, it plays a particularly important role via its impact on later stages.

2.2. Information gathering

Once a problem is understood, the tendency may be to begin generating new ideas. Such an approach, however, would be premature. Instead, upon gaining an understanding of the nature of the problem, it appears best to then begin gathering and considering information - particularly information that is relevant to the situation at hand. In fact, research has shown that individuals who are able to attend to relevant information, while ignoring irrelevant information, are more likely to produce creative ideas [14].

2.3. Concept selection

Following an intensive search for information relevant to solving a problem, one is oftentimes left with a fairly large and wide range of data to sort through. Consequently, the next step in the creative process is to select for further exploration the concepts - or bits of knowledge - most relevant to the situation at hand [14]. Thus, it appears that

individuals who can clearly organize ideas into relevant concepts and select those concepts most pertinent to the current situation are best able to generate creative ideas.

2.4. Conceptual combination

Of the processes discussed thus far, it appears that the act of combining new concepts, or conceptual combination, may be the most critical to creative performance. As may be suspected, conceptual combination involves taking the relevant notions from the concept selection stage and combining them in new, unique ways. What is less clear, however, is how such ideas are ultimately combined. Mumford and colleagues [13,16] suggest that when a situation requires the combination of ideas that are characterized by similar features, one may simply apply the combination rules used in previous attempts. When the situation is notably different, however, an individual may use something akin to a metaphor - or abstract guiding concept - to direct the combination of relevant concepts.

2.5. Idea generation

Once ideas have been reorganized and combined in new ways, the next step is to formally generate ideas deriving from the new reorganization. As may be surmised, combining concepts and formally generating new ideas are closely related cognitive processes. Where the two processes differ, however, is in their degree of abstractness. During the conceptual combination stage, individuals are attempting, globally, to combine previously unrelated concepts - to get a feel for what broad ideas may be placed together. During the idea generation stage, individuals are attempting to formally take those conceptual combinations and create new, workable ideas.

2.6. Idea evaluation

When considering the creative processes described by Mumford et al. [8], it appears that idea evaluation has received relatively less attention than the other processes. Such a lack of investigation might at first glance suggest that this process is of lesser importance. Recent research, however, indicates that idea evaluation may be a particularly important aspect of creativity [17-20]. Idea evaluation involves the consideration of ideas in light of potential outcomes deriving from, and resources needed for, its implementation [21]. Idea evaluation appears most critical to the generation of new ideas by focusing resources on ideas that are most likely to be of utility for the situation at hand. Conversely, ideas that have little usefulness are often discarded at this stage. This is particularly important upon consideration of creative problems - problems or situations often characterized by few, or limited, resources.

2.7. Implementation planning.

Once ideas have been properly "fleshed out" and taken from abstract to relatively concrete, their implementation must ultimately be considered. Recent research suggests that planning, specifically, is an important determinant of organizational innovation [22]. More precisely, planning appears critical for several reasons: (a) plans help properly guide and maximize limited resource scenarios characterizing creative efforts, (b) without plans it is particularly difficult to align broader business strategies with creative efforts and (c) for organizations to sus-

tain innovation, they must have plans, preferably multiple plans, to implement projects and ideas over time [23].

2.8. Monitoring

No idea, however well conceived, is guaranteed success. As such, monitoring ideas and their implementation is an important element of the creative process. Specifically, monitoring activity is vital due to the feedback, good or bad, that may be gleaned from an idea's implementation. Such feedback helps guide and facilitate additions, deletions, adjustments, or alterations that may be made to creative ideas or processes. It is important to note that monitoring information may be used to make changes at nearly any stage in the creative process - illustrating the dynamic, oscillating nature of creative idea generation. Put another way, monitoring is critical to the continual improvement of creative ideas.

3. FURTHER EXPLORATION OF THE EIGHT PROCESS MODEL

Having considered each stage of the model broadly, we turn to more specific applications and considerations of the eight stage model. More precisely, we will examine the eight-stage process model in relation to research exploring: (a) ability and creative personality, (b) knowledge and creative thinking, (c) errors in idea evaluation, (d) causal analysis and its influence on idea generation, (e) multi-level influences, and (f) enhancing creative processes through training. Finally, we conclude with a discussion and brief commentary on the role of creative thinking in the workplace.

3.1. Ability and creative personality in problem construction.

As noted earlier, the first stage in the generation of a creative solution involves identifying and considering the exact nature of the problem or situation. Until relatively recently, however, the question remained as to what factors, specifically, influenced success or failure at this stage. Fortunately, recent work by Reiter-Palmon and colleagues [24,25] has shed some light onto these factors. The results of these studies reveal that problem construction ability is positively related to the originality and usefulness of solutions generated across several domain types (i.e., leadership, school, and social). Similar positive correlations were also found [25] when ability and personality fit were conjointly examined. The unique contribution of the later study, however, was the additional investigation of personality where fit between personality and situation accounts for additional variance above and beyond that accounted for by ability and requisite covariates.

3.2. Knowledge structures and creative thinking

There is an old adage that one cannot create something from nothing. Accordingly, during the conceptual combination and idea generation stages, individuals are cognitively combining something - be they termed concepts, notions or ideas. Such concepts, notions or ideas may more accurately be labeled knowledge. Knowledge, then, stands as the ultimate building block of the combination process. Broadly defined, knowledge may come in several forms: schematic, associational, or case-based [23].

Following work by Mumford et al. [3]

and Hunter, Bedell and Mumford [26] examined how these different types of knowledge structures impacted the conceptual combination and idea generation processes. Specifically, the researchers manipulated the number and type of knowledge structures salient to participants. The results of the study revealed that the elicitation of either schematic or associational knowledge alone resulted in a greater number of ideas generated. Use of multiple knowledge structures, however, resulted in higher quality and more original ideas - particularly when schematic or associational structures were paired with case-based knowledge. It seems that previous experience (i.e., case-based knowledge) is relevant to creative performance - but only if individuals also have additional knowledge to enhance knowledge based on past experience.

3.3. Idea evaluation and errors.

As noted earlier, the evaluation of ideas is a critical creative process and one that has, overall, been underinvestigated by the majority of creativity researchers. Fortunately, work by Mumford and colleagues has shed notable light onto this critical creative process. A model put forth by Lonergan, Scott and Mumford [20] proposes that idea evaluation is an aspect of idea implementation, where ideas are "forecasted" into future situations. Potential ideas, then, are appraised in relation to a variety of standards including popularity, potential impact, workability, risk, and cost. What is particularly noteworthy about Lonergan et al.'s model is the generativity involved in the evaluation process. Ideas may be reshaped and reformed during this stage, depending on the evaluative outcome. Thus, evaluation is not only a judging or decision tool whereby ideas are either kept or tossed aside - it is also a dynamic generative process, where ideas are potentially reformed and adjusted. Provided, of course, an adequate adjustment may be found allowing for their continuation.

As is implied by the model, the quality and originality of adjusted ideas is only as good as the standards applied in the evaluation process. Unfortunately, errors are inherent in the evaluation process - particularly for the evaluation of creative ideas. We simply make mistakes in our assessment of whether an idea is worth pursuing [27]. The question brought to fore, then, is: What factors influence the likelihood of these errors? A series of recent studies [20,27,28] have attempted, rather successfully, to shed some light onto this question.

By definition, creative ideas are novel. Taken a step further, novel ideas are inherently different from ideas or processes currently in use. This break from the status quo has led to a variety of errors occurring when highly original ideas are evaluated. Specifically, three reasons may account for the evaluation errors associated with very novel ideas. First, evaluation standards are generally based on the current goals of the organization. Because a creative idea is novel, it may not fit with current organizational goals but rather with new (potentially better) differing goals. Second, evaluations often occur in relation to past performance. The rarity and relative infrequency of creative ideas makes it difficult to compare them to previous instances of achievement. Finally, the novelty of creative ideas makes it difficult to recognize the key and critical attributes that could potentially contribute to greater organizational performance. All three of these factors have led individuals to discount the potential contribution of highly

novel ideas. In fact, a study by Licuanan et al. [27] found that there was a greater frequency of errors associated with very novel ideas than with less novel ideas. Similar results were also found in a study by Blair and Mumford [28], in which participants preferred unoriginal ideas when asked which ideas should be used for further exploration.

Unfortunately, idea novelty is only one factor that has led to errors in creative idea evaluation. Building off the notion that individuals use standards to evaluate the utility of an idea, Blair and Mumford [28] hypothesized that participants would apply social consequence standards to idea evaluation - or consider ideas in light of potential social outcomes. Specifically, Blair and Mumford [28]theorized that risky ideas would be less preferred because (a) they have the potential to produce negative outcomes, (b) their pursuit may be viewed as irresponsible by others and (c) the pursuit of such ideas may be associated with self-indulgence and self-centeredness. The results of their study supported their hypothesis, with risky ideas being preferred less by participants.

One final process impacting errors during the idea evaluation phase is tied to forecasting. Again, during the idea evaluation stage ideas are mentally placed, or forecasted, into future scenarios. Similar to standard comparison [28], this process of future prediction and consideration is also open to potential biases and errors. Elements such as underprediction of requisite resources and overconfidence in potential success may lead individuals to be somewhat optimistic in their assessment of an idea during this forecasting stage. In fact, in a study examining forecasting errors, [18] provided participants with several case studies and asked them to evaluate the ideas with regard to resource requirements and potential consequences. The results revealed that when participants had some familiarity with the issue in the case study, they overestimated potential outcomes and underestimated resource requirements. In this sense, it may appear that expertise (i.e., familiarity with a given topic) is a detriment to creative performance. Closer examination of the results revealed that this is not, in actuality, the case. In fact, expertise was associated with greater accuracy of future predictions - particularly with regard to organizational impact and difficulties involved in implementation and novelty. The results, then, reveal somewhat of a paradox: To reduce errors in idea evaluation, expertise is both desired and not desired. To solve this paradox, it would seem best to involve expertise in the evaluation process, but also have individuals with less familiarity paired with experts during the idea evaluation process. Put another way, expertise will reduce errors in idea evaluation, but that expertise must be tempered with the opinions of less expert others.

3.4. Causal analysis in idea generation for social innovation

Recently, the research emphasis has been placed on innovation occurring in areas where creativity is thought to commonly occur such as the visual arts, writing, engineering and the sciences [29-33]. A domain receiving less emphasis, though of seemingly equal or potentially greater importance, is social innovation. Marcy and Mumford [24] defined social innovation as, "the generation and implementation of new ideas about people and their interactions within social systems." (p. 3). Witness the work of Henry Ford who implemented the assembly line in the automotive industry revolutionizing how

cars were manufactured. Such innovation not only required the consideration of shop floor plans, requisite tools and expense forecasts - it also involved the employees and their interactions as social beings. Based on the final outcome of Henry Ford's work, it is evident that social innovations have potentially far reaching and substantial workplace implications.

From the above example one thing is readily apparent: social innovations are complex, yet highly important phenomena [34]. As such, an important question arises: What factors may be identified that influence idea generation occurring in the social domain? Efforts by Mumford and colleagues [34-36] have provided some insight into this question. In a study examining concept selection, idea generation and implementation planning, Marcy and Mumford [34] gave participants six social innovation problems occurring in business and educational domains. Prior to solving these problems, researchers provided participants with training in causal analysis. Similar to the concept selection process, causal analysis refers to the consideration of factors that influence, or cause, certain outcomes. Because social innovations are so complex, having the ability to determine the importance of relevant causes is particularly critical to creative success in the social domain [37]. Once solutions to problems were generated by participants, Marcy and Mumford [34] also manipulated implementation planning by asking participants to forecast their ideas into future scenarios. This forecasting manipulation was further augmented by requiring half of the participants to forecast ideas into future scenarios where their friends or family were involved, while the remaining half forecasted scenarios where their friends and family were not involved. The results of the study suggest that training in causal analysis resulted in more original ideas. Moreover, by having participants forecast future scenarios that contained family members and friends, solution quality and originality was also increased. Thus it seems that by creating personal involvement and providing individuals with the tools to better understand problems through training, creative idea generation is enhanced.

3.5. Cognitive processes - a multi-level perspective

The generation of original ideas appears to be an inherently individual level phenomenon and, in many ways, this is indeed the case. However, denying the multi-level impacts (i.e., team, organization and environmental factors) influencing creative idea generation at the individual level may result in a substantially narrowed - and potentially misleading - view of creativity. For example, an organization with few resources and high demand for output (organizational-level factors) may leave employees with little "extra" time for deliberation and consideration of new ideas, in turn impacting the creativity of ideas put forth by individuals. Though many more examples exist [3], the above suffice to make our basic point: creativity is an inherently multi-level phenomenon and must be considered as such before a full realization of creative potential may be made. Further, failure to take into consideration multi-level conflicts may result in notable decreases in organizational innovation [3].

Recent efforts by Reiter-Palmon, Herman and Yammarino [10] have resulted in a relatively comprehensive multi-level review of the eight process model. More precisely, the authors reviewed each process, considering

both individual and team level influences-exploring how such processes may be maximized to enhance innovation. The reader is invited to examine the chapter for greater detail and discussion of this topic, but a summary of the work reveals at least three notable points. First, in a team setting individuals may arrive at various creative process stages at differing time frames. This varied creative stage arrival may be due to differing degrees of importance held by individuals (i.e., one team member may have a preference for concept selection), or the oscillating, back and forth nature of the creative processes themselves. Second, because individuals may be at differing stages of consideration and cognition, the team-based approach to innovation may require more time than individual level exploration. This extra time is necessary for each team member to arrive on the "same page" as the other team members. Finally, team creativity may be best facilitated by comprising teams of varying levels of creative personality and ability. Though there may be some conflict due to differences of opinion, the ideas generated will benefit from these varied inputs.

Though the multi-level investigative efforts by Reiter-Palmon et al. [10] represents a fairly comprehensive review of the eight process model, other researchers have chosen to focus on one multi-level aspect of creative thought. Specifically, recent efforts by Mumford, Bedell and Hunter [22] explored implementation planning from a multi-level perspective. Again, planning plays a critical role in creative efforts by helping focus resources onto those ideas that are most feasible, of greatest utility and are consistent with goals determined in earlier creative processes (e.g., problem construction). What is noteworthy about the work by Mumford et al. (in press) however, is the multi-level nature of their approach. More precisely, Mumford et al. presented a multi-level model of innovation planning where individual level factors (e.g., mission planning) impact group factors (e.g., relationships), organizational factors (e.g., climate), and environmental factors (e.g., environmental trends) either directly, or indirectly vis-à-vis other factors. Moreover, each element may then have an impact on other elements resulting in a recursive, dynamic relationship. The point, broadly made, is that although planning is an individual level cognitive phenomenon, it is impacted by a host of other inputs in a dynamic, interrelated fashion.

4. TRAINING AND ENHANCING COGNITIVE PROCESSES

The above discussion of cognitive creative processes should suffice to make a basic point: understanding the cognitive process model is critical to enhancing organizational innovation. If this point is granted, a new question then comes to fore: How can such processes be improved? Or, put directly - can such processes be trained? A recent meta-analysis by Scott, Leritz and Mumford [11] answers this question by reviewing over 70 studies on creativity training. The results revealed, rather convincingly, that (a) training overall improves creativity, and (b) training the cognitive processes discussed thus far produces the strongest, most consistent improvements in creative performance. The authors suggest that the obtained support for the eight process model is likely due to the fact that such training provides strategies for working with already available knowledge.

5. CONCLUSION

We began our discussion highlighting the importance of creative cognition to organizational innovation. To reiterate, before an organization can implement new ideas, it must first obtain such new ideas. Thus, the generation of original, useful concepts stands as a critical initial step in obtaining a competitive advantage through innovation. Further, by understanding the processes involved in idea generation as well as the important antecedents and influences of these factors an important step toward organizational success and performance is taken.

To better understand how ideas are generated, the eight process model of creative thought developed by Mumford and colleagues was presented. This model has been supported in numerous studies and provides researchers and practitioners with a concrete framework for understanding how innovation begins. This model was then viewed in relation to a host of related factors including personality, ability, knowledge, errors, multilevel perspectives and training. The results of such efforts, we hope, should provide the reader with not only an understanding of the eight process model, but also relevant antecedents and outcomes deriving from its use. We conclude with a summary of observations derived from reviewing this work in the hopes of providing one final set of general recommendations for understanding creative cognition in the workplace.

First, it is clear that idea generation is a time-consuming and resource intensive activity. Thus, multiple meetings, considerations, and iterations are necessary for highly creative ideas to be derived. Second, and on a similar note, an organization must be fully dedicated to innovation if innovation is to occur. Employees must be provided with both the time and resources necessary to generate new ideas. Further, this support must occur over a relatively lengthy time-frame. In addition, an organization must be committed to seeing ideas through, even if such ideas oscillate between generation and evaluation before becoming fully realized, workable products or processes. Additionally, because innovative ideas are inherently novel and different, they may be met with some discomfort by those evaluating their utility. An organization must create and facilitate a working environment that supports the generation, review and consideration of new - potentially risky - ideas. The third observation, seemingly paradoxically stated, is that idea generation does not end with the generation of an idea. A review of the eight stage process model reveals that once concepts have been combined together (i.e., idea generation), there are numerous stages an idea must subsequently pass through before it can be fully useful to an organization. Moreover, there exists a possibility that an idea may never be truly "finished" but rather in a state of continuous innovative improvement. Fourth, a review of the research reveals that teams play a particularly critical role in the idea generation process. Though it is relatively clear how teams are necessary to implement creative ideas, it has been somewhat less clear with regard to the impact of team composition on initial idea generation. What one team-member says may impact, positively or negatively, the ideas generated by another teammember. Further, the use of teams inherently means that idea generation will require somewhat more time than individual idea generation - reiterating again, the importance of an organization's dedication to the support of innovation. Fifth and similar to the fourth observation is that idea generation is a multi-

level phenomenon. Though ideas are ultimately derived from individuals, there are a host of inputs occurring at the team, organization and environmental levels. By considering, altering, and adapting to such influences, a notable advantage is gained. Sixth, there exist concrete, obtainable training programs that can enhance creative idea generation and thusly should be taken advantage of. Seventh, and finally, it appears that expertise is a necessary component of idea generation. Caution, however, is warranted with such a blanket statement - under some circumstances, expertise may result in overconfidence and may act as a detriment to innovation. Thus it may be necessary to somehow balance and temper expertise, though exactly how to do so is yet to be determined.

In sum, the generation of new ideas is a difficult, time consuming activity that must be engaged in if an organization seeks to be truly innovative. By fully understanding the processes involved in idea generation, however, an important first step is taken. Further, by facilitating and supporting each stage as well as being dedicated to long-term innovation it appears that organizations may be able to obtain the competitive advantage provided by being the first to put forth an original product or process.

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