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IMPROVISING AT WORK:
THE DIFFERENCES BETWEEN EXPERTS AND NOVICES

Maria da Graça Câmara Batista and Miguel Pina e Cunha*

ABSTRACT. Improvisation is being presented as a relevant process in organizational environments marked by speed and unpredictability, but it is still an under-investigated topic. The theoretical question for which we seek to provide a preliminary insight is: How does novice behavior differ from expert behavior with regard to the use of improvisational action? We build on the integration of several disciplines to advance a theoretical model. We predict that several constructs will have differential effects on the adoption of improvisation by experts and novices. The paper contributes to the literature by suggesting that unexpected events will be approached differently by people with different levels of expertise, something which in turn will have both theoretical and applied implications.

INTRODUCTION

A nascent body of theoretical and empirical work is presenting improvisation as a relevant process for organizations competing in turbulent and shifting business environments, which demand fast and flexible decisions in order to accommodate external change (Eisenhardt, 1997). However, the theme has still received limited attention from management scholars (Crossan & Sorrenti, 1997). Such a lack of attention may be due to the assumption that planning tends to be superior to improvisation. Another justification has to do

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with the fact that improvisational behavior is expected to occur only occasionally in organizations, in atypical situations where fast learning and adaptation are crucial and formal systems fail.

Crossan and Sorrenti (1997) present organizational improvisation as spontaneous, intuition-guided action, and Weick (1993) defined it as the ability to act with the available resources on the spur of the moment. Organizational improvisation has also been defined as the conception of action while acting, by an organizational member, using the available resources (Cunha, Kamoche & Cunha, 2002). Organizational improvisation is, then, the deliberate fusion of design and execution of something novel (Moorman & Miner, 2002). It involves a certain degree of novelty (instead of the strict compliance to existing rules) and some degree of intent (instead of random deviations to existing rules) (Baker, Miner & Eesley, 2003). Organizational improvisation implies that an organization's members, at a particular moment in time, can abstain from activating pre-existing routines and instead develop *ad-hoc* solutions on the spur of the moment (Miner, Bassof & Moorman, 2001).

It is an organizational process that facilitates the interaction between the creative capacities of organizational members and organizational routines and structures (Crossan, 1998; Kamoche & Cunha, 2001). An organization's capacity to improvise is developed over time through continuous nurturing of learning-by-doing and knowledge accumulation of improvisational skills. Improvisation has been presented as a circular learning process, occurring through moving and processing information, acting on that learning and, as a result, accumulating knowledge (Chelariu, Johnston & Young, 2002). It is facilitated by a minimal kind of structure, meaning that improvisation is not a purely unconstrained behavior (Cunha, Kamoche & Cunha, 2002). Organizational structures must facilitate action without constraining it. The recourse to improvisation allows the improvement of an individual's ability to take into account intuitive insights, and the development of skills related to the determination of action possibilities and the selection of appropriate actions to a given context (Crossan & Sorrenti, 1997). To improvise, an individual has to make use of memory and previous experience in order to proceed more spontaneously and to become assertive, which is an essential skill in improvisation (Weick, 1998).

In this work, we study the process of improvisation in experts and novices. We start with a brief distinction between experts and novices, develop a model of improvisation by experts and novices, and discuss four propositions for further research. The paper contributes to the organizational literature by exploring the way experts and novices approach improvisational tasks. To our knowledge, this is the first attempt to articulate a theoretical model of improvisational action by experts and novices in the context of organizational action. We believe this is a relevant topic for investigation due to the potential consequences of improvised action in such settings as medical practice, managerial decision making or new product development, to name just a few contexts where improvisation has been previously studied. As a departing point, we suggest that competent improvisation by seasoned professionals may be a plus in these contexts, in the very same way that incompetent improvisation by experienced or inexperienced professionals may produce disastrous consequences. Hence our interest in the topic.

EXPERTS AND NOVICES

The behavioral differences between experts and novices remain to be studied in the organizational improvisation literature. The relevance of this distinction results from the fact that improvisation implies a pre-determined set of capabilities and skills that can be related to the adoption of improvised behaviors by experts and novices. Thus, unexpected events will presumably be approached differently by people with different levels of expertise.

According to the literature, an expert is someone "recognized within their profession as having the necessary skills and abilities to perform at the highest level" (Shanteau, 1992, p. 255), as well as having the competence to apply the knowledge attained from previous experiences and training (Spence & Brucks, 1997). Experts are commonly characterized as: (a) having a specialized area of knowledge; (b) being quicker in their ability to solve problems in a successful way; (c) understanding how their area of expertise is structured and the interrelation of themes and pieces of information; (d) having specific work-related memories and the ability to remember complex details from past experiences, especially those related to infrequent or inaccurate situations; (e) understanding the intricacy of a situation; and (f) being capable of determining which

judgment rules can be applied in each case (Cornford & Athanasou, 1995).

Novices, on the other hand, are still studying or have recently started a professional occupation (Cornford & Athanasou, 1995), and seek logical and consistent rules to guide their behavior. They are restrained into those rules and are limited to them in order to solve any situation. Regularly, novices study for years and may work at sub-expert levels. They still lack some of the abilities needed to act as experts (Shanteau, 1992).

Superior expert performance may result from a principled approach to problem solving (Marshall, 2002). Several studies have shown that experts outperform novices in their domain of expertise and, particularly, in the application of the grounded principles of those domains (McDonald & Stevenson, 1998). Some of the professional domains where differences between experts' and novices' cognitive processes have been studied include accounting, auditing, medical diagnosis and computer programming (Bacdayan, 1996).

Even if one can intuitively presume that job performance increases as workers gain expertise (Spence & Thorson, 1998), empirical evidence suggests inconsistency. In some situations (e.g., quality appraisal services and resistance to change) the effects of expertise can be negative, because it tends to act as a barrier to attitudinal and behavioral change (Crossan & Sorrenti, 1997). Brailey, Vasterling and Franks (2001) refer to studies that have not found significant differences between expert and novice performance. Commonalities amongst these studies (e.g., environments characterized by dynamic stimuli or that require the execution of complex tasks) suggest that under those conditions effective expert and novice use of improvisation may become similar. Other research indicates that expert performance differs slightly from novice performance in most clinical and medical settings (Marshall, 2002). Johnson et al.'s (1981) study on medical diagnoses suggests that novices' disease schemata or templates were characterized by simplicity and imprecision. These, according to Schenk, Vitalari, and Davis (1998), can lead to diagnostic reasoning error, and to a desire to avoid improvisation by novice physicians.

Other researchers mention superior novice performance in

residential property value (Spence & Thorson, 1998), in e-commerce environment decision-making and in environments with "low-control conditions" (Wu & Lin, 2006, p. 297) in forecasting (Shanteau, 1992), in business computer-based simulations (Stark, Renkl, Gruber & Mandl, 1998), and in electronics (Besnard & Bastien-Toniazzo, 1999).

Despite the lack of agreement, it is often assumed that experts and novices behave differently. These differences are related to several factors including cognitive structures, problem-solving approaches, knowledge storing and retrieval, information search and task structure. Since differences in performance have been studied in several professional domains, it seems relevant to extend those studies to improvisational behavior in experts and novices. In the next section we focus on this topic.

IMPROVISATION BY EXPERTS AND NOVICES

The major goal of this study is to provide a preliminary insight into the following research question: how does novice behavior differ from expert behavior with regard to the use of improvisational action in organizations? This question may help shed light on the process of learning by professionals and contribute to the literature on improvisation. To address this question we seek to integrate several fields of study on the behavioral differences between experts and novices: differences in expert and novice knowledge, problem-solving, information usage, and task requirements. Using the literature collected from several fields (e.g. management and organizations, psychology, education), the research question is explored and testable propositions are derived. We consider four major fields of inquiry: knowledge, problem-solving, information processing, and task characteristics.

Knowledge Storage and Retrieval

A fundamental factor that marks the shift from novice to expert is the replacement of knowledge storage as isolated facts and loosely bounded chunks of information to knowledge structures that are well developed and integrated (Azzarello, 2003). Lord and Maher (1990) noted that experts and novices differ in the way knowledge is represented in their memory, as well as in the way their knowledge

a framework for understanding and encoding new knowledge, and for retrieving information (Nadkarni, 2003) that enables the user to understand a situation or a set of facts. According to Hinds, Paterson, and Pfeffer (2001), one stable finding in experts' studies is that mental constructions become more abstract as expertise grows. Experts' task component lists are composed of fewer and less-specific stages than those of people with limited task experience. In comparison with novices, experts are better able to encode and process information in a more conceptual and abstract way (Hinds, Paterson & Pfeffer, 2001).

According to Hillerbrand (1989, p. 293), experts organize their knowledge into extended and intricate structures in memory that allow them to "make broader inferences, unify superficially disparate problems by underlying, often subtle, features, and make qualitatively more sophisticated, critical, judgments."

By definition, experts have a larger body of knowledge about their domain of expertise (Hinds, Paterson & Pfeffer, 2001). A large amount of research has indicated that experts exceed novices in their knowledge scope especially regarding the use of the grounded principles of those areas (Marshall, 2002). According to Larkin et al. (1980), research has demonstrated that experts possess more accurate memory of new experiences in their domain, but this superior memory is limited to the domain of expertise and can be viewed as the result of acquired skills and knowledge relevant to each specific domain.

Experts' knowledge structures are deeply related to creativity and since the ability to produce new and useful courses of action is a major component of improvisation, experts are more able to use this type of behavior. An expert is also someone who understands situations intuitively (Cornford & Athanasou, 1995). The literature suggests that improvisation is highly intuitive in nature (Vera & Crossan, 2004). This will allow improvisational performance by experts to be more fluid and qualitatively different from the novice's performance. From this we derive our first proposition:

Proposition 1a: Because of their extended and interconnected knowledge structures, experts will use improvised behaviors more often than will novices.

Novices' knowledge structures restrain their ability to identify the importance of the different components of a stream of information since they cannot relate the present situations to past events, and prioritize the importance of facts (Schenk *et al.*, 1998). For example a novice may not detect the relevance of a particular piece of information just because he/she cannot match that information with previously encountered patterns. Considering that action is a fundamental element in improvisation, lack of previous action represents absence of previous improvisational learning (by doing).

According to cognitive scientists, experts seem to be more able to properly use their knowledge because they have their declarative knowledge (propositions and schemata) closely connected to conditions of use (Azzarello, 2003). This conditionalized knowledge is contrasted with "inert" knowledge, i.e. significant knowledge that cannot be used in other situations. This means that even in the presence of a difficult situation this knowledge is not triggered (Bransford, Brown & Cocking, 2000). This leads to a further proposition:

Proposition 1b: It is more likely that experts' expanded and developed cognitive structures enable the identification of relevant triggers that can induce improvised behavior.

Experts' characteristics include more developed attention abilities, an intuitive feeling to identify what is relevant, better identification of exceptions to rules, and a tendency to perform effectively even under stress (Shanteau, 1992). The capacity to improvise under stress and to perceive that rules are no longer adequate to the nature of the situation, have been indicated as precedents of improvisation by Weick (1993), who has shown that individuals may simply revert to well trained behaviors even when these are dysfunctional. For instance, when faced with a particular situation, both experts and novices may consider a previously tested course of action even when the conditions that underlie the event are completely different from those that gave origin to the pattern of response, and even when they perceive that the response is not adequate.

Differences between knowledge organization among experts and novices are also related to the amount of episodic knowledge available. This type of knowledge, as Schenk *et al.* (1998) have

pointed out, is related to the "organized accumulation of job-specific situations or events" (p. 13), as, in medical practice, an adjustment in a procedure to detect the veracity of patients' symptoms. When novices possess this type of knowledge, its organization is shallow when compared to that of experts. Consequently, novices may probably be "lacking grounded, domain-specific knowledge" (p. 13). Improvisational knowledge is practical knowledge, including knowledge of available resources and how to transform them according to need. In other words, improvisational capacity and bricolage (i.e. making do with the available resources), are practical rather than purely abstract matters. Hence:

Proposition 1c: Experts' episodic knowledge implies a higher-level activation of improvisational behavior, because they are more able to transform available resources to fit novel situations.

Information Processing

Lazonder, Biemans, and Wopereis (2000) argued that search performance is increased by domain expertise; experts in a particular area, when compared to novices, exhibit higher levels of both efficiency and effectiveness.

Empirical findings indicate that knowledgeable decision makers are more selective and better able to acquire information from the environment (Shanteau, 1992). They search for information in a more flexible way, and agree more on what information is relevant. One of the characteristics that distinguish experts from novices is the speed and ease with which experts retrieve the particular knowledge that is relevant to the problem at hand. Experts tend to be more specific when drawing their attention to something; however, this may lead to the loss of some valuable information (Spence & Brucks, 1997).

Experts use a history strategy calling on previous experience to understand the meaning(s) and possible causes of predicted and unpredicted changes in the situation. This requires a sophisticated understanding of many factors, which is learned over time and enhanced by experience. They use several strategies to guide information gathering, such as history, sets (chunks of related items that can be identified in a very short period of time) and class (information splitting according to the degree of complexity). This allows for accurate situation understanding and good final decision accuracy. Experts cluster information, which makes information

gathering less of an effort. This information clustering also helps experts to better understand situations and decide what the appropriate reactions/solutions are. It may also help the development of the deeply structured body of knowledge that is necessary for a proficient performance. It can be assumed that experience positively influences ability to interrelate relevant information and to make adequate decisions (Kirschenbaum, 1992).

Previous research suggests that experts incorporate the use of extended information, whereas novices direct their attention to information that is directly related to the task (Biggs, Mock & Watkins, 1988; Marshall, 2002). Experts have the ability to manipulate the available information into their standards of knowledge (Bransford, Brown & Cocking, 2000), and correspond this information to the real problems. This process allows the experts to retain only relevant information, and consequently increase their cognitive capacity, which results in focusing attention on peculiar or singular events, as well as in a faster codification of information into memory (Hillerbrand, 1989). Ericsson, Patel, and Kintsch (2000) consider that experts possess superior skills in identifying and maintaining access to relevant information, which allows them to consistently choose more appropriate actions than novices do in analogous situations. Thus, we propose that:

Proposition 2a: Novices' information processing enhances the use of improvisational actions, because they have more difficulties in accessing existing knowledge.

Researchers have found that experts use a limited quantity of information compared with novices. This appears to be due to a well directed information search associated with well structured knowledge schemata that allows, for example, expert physicians to be able to identify the probable causes for a particular medical condition even when all information is not available. Novices need to use a search strategy that is based on quantity and that is not well focused, because they lack the knowledge of what is important and try to examine "as much information as possible" (Kirschenbaum, 1992, p. 345). Non-experts do not exhibit, as experts do, superior memory ability (Ericsson, Patel & Kintsch, 2000). As Kirschenbaum (1992) mentions, experts not only use a lower quantity of information, but they are better able to retrieve relevant information. They do so by using a strategy that facilitates the re-examination of information,

with the available information being examined more than once. We therefore hypothesize the following:

Proposition 2b: Novices' information processing favors the use of improvisational actions, because they do not focus information collection and are not able to complement missing requirements with information retrieval from their memory.

Approaches to Problem Solving

The understanding of a problem is also affected by knowledge organization, which appears to be different in novices and experts (Chi, Feltovich & Glaser, 1981; Schoenfeld & Hermann, 1982). As noted by Schenk *et al.* (1998), several studies have pointed out that a relevant aspect of expertise is the organization of information within the cognitive structure. Discrepancies between experts and novices rely on the amount of specific skills they have, and on the way they organize them, whether partitioned or in interrelated areas (Cornford & Athanasou, 1995).

Yarlas and Slousky (2000) mention that "there is a large body of literature indicating that in problem solving, reasoning, learning and transfer, and problem categorization, novices tend to focus on surface features rather than deep relational properties" (p. 1006). Experts assemble situations according to related concepts and are likely to recognize a set of patterns from the given information, whereas novices look into the problems only in a superficial manner (Bransford, Brown & Cocking, 2000). Studies in areas such as chess, mathematics, physics and computer programming, both in deductive and inductive inference have demonstrated this fact (Adelson, 1984; Bassok, 1996; Novick, 1988; Reed, Ackinclose, & Voss, 1990; Yarlas & Slousky, 2000). This does not imply that novices lack knowledge of the principles; it means that they do not attend to the principles when confronted with surface features (Yarlas & Slousky, 2000). From this, we derive the following propositions:

Proposition 3a: Experts' approach to problem solving (according to deep principles) requires improvised behavior less frequently, because they are better able to recognize known patterns of a problem and solve it according to tested solutions.

Proposition 3b: Novices' approach to problem solving (surface elements) requires improvised behavior more frequently, because

they are less able to recognize known patterns of a problem and have more difficulties in retrieving tested solutions from memory.

Problem-solving behaviors are affected by the content and organization of knowledge structures. This reflects differently upon novices' and experts' performances since it has to do with their knowledge structure. Research on the differences between experts and novices has found that the two groups differ significantly in their approaches to problem solving (Larkin *et al.*, 1980), and consider different strategies regarding this matter (Spence & Brucks, 1997).

Experts are more accurate in detecting the problem's complexity. Spence (1996) mentions that novices appear not to be able to estimate the adequate difficulty of a problem and occasionally adjust their decision-making inaccurately. Novices and experts use different problem-solving strategies. More often than novices, they develop plans or principles before solving a problem and some are even able to develop an entire solution plan beforehand (Priest & Lindsey, 1992; Marshall, 2002).

Novices represent problems in a syntactical style as opposed to experts' conceptual form. They focus on specific problem implementation issues, whereas experts are better at generalizing the problem. According to Schenk *et al.* (1998), "experts consider multiple problem solving strategies, but novices usually attempt the first method that comes to mind" (p. 17). Hence:

Proposition 3c: Experts' knowledge structures promote the use of improvised behaviors since they allow the identification of multiple problem solving strategies that can include improvisation.

Task Structure

Experts' and novices' work strategies are driven by the way tasks are structured: "If tasks are inherently unstructured, even experts may not be able to apply tested solutions" (Spence & Brucks, 1997, p. 235). These conditions do not allow a proficient expert performance (Shanteau, 1992), but can be potentially enhanced by the use of improvisation. In such cases, they must use heuristics that allow simplification of knowledge structures in such a way that information-processing demands are reduced (Schenk *et al.*, 1998). Nonetheless, given that novices are shallow in episodic knowledge

(the integrated accumulation of job-related situations) "their use of heuristics would, most likely, be limited and ineffective" (Schenk et al., 1998, p. 20).

Conversely, general problem-solving knowledge may be adequate to solve the problems in domains that can be described as well structured. Thus, novice performance might strive to be equal to expert performance since experts are supposed to immediately follow reasonable problem-solving strategies. Consider that tasks are seen as an intermediate category, ruled by a set under-structured but possibly structurable situations (Spence & Brucks, 1997). As resource breakdowns or changes in the contextual environment occur, then experts should have a superior improvisational performance when compared to novices.

Experts have a more advanced understanding of the task, but they also have a bias toward their abstract knowledge and their own experiences (Hinds, Paterson & Pfeffer, 2001). According to Hinds (1999), this reliance on personal experience is difficult to suppress. As noted by Crossan and Sorrenti (1997), if the organization faces a stable environment, expert discernment or intuition is an extremely valuable resource, since it increases performance effectiveness (Brown & Eisenhardt, 1997).

According to Spence and Brucks (1997) experts will certainly have a good performance when "in environments in which mental models (...) can be tested and refined" (p. 234), i.e. in objective, every-day situations. On the other hand, they argue that in situations of novelty, with "dynamic stimuli, involving decisions about human behavior" (p. 234), experts act the same as novices do. Therefore, the results of expertise may depend on variables external to the person's features. When faced with known situations these promptly lead to the existing knowledge structures, and therefore suitable decisions can be quickly made (Morrow et al., 2003). Hence, these are our final propositions:

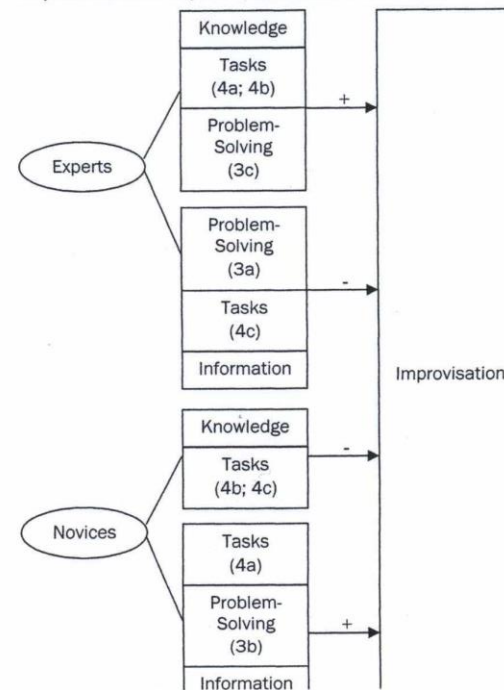
Proposition 4a: When facing unstructured tasks, the use of improvised behaviors by experts and novices will be high, because known solutions are less applicable.

Proposition 4b: When facing under-structured tasks, the use of improvised behaviors by experts will be high, because they possess more previous knowledge to interchange between tasks.

Proposition 4c: When facing well-structured tasks, the use of improvised behaviors by experts and novices will be low, because the existing solutions will be satisfactory.

Taken together, these four propositions can be organized into a model where the influence of the different constructs has an impact on the triggering of improvised action by experts and novices (see Figure 1).

FIGURE 1
Improvisation in Experts and Novices: A Theoretical Model



CONCLUSION

We integrated the literature of organizational improvisation with that on experts and novices. The exposition of constructs and the hypothesis development considers a dichotomy between experts' and novices' behaviors, but it should be noted that there is a continuum between being a novice and an expert. Expert knowledge structures and long-term memory will influence the use of improvisation and its impact on organizations, with improvisation enriching organizational memory through the facilitation of experimenting by individual members (Moorman & Miner, 1998). It will also influence the integration of improvisations into the action repertoire included in the organizational memory, which, in turn, will influence the ability of organizational members to improvise. Their knowledge and stable competencies are not inconsistent with organizational improvisation, since the existence of prior knowledge and pre-existing routines are important for improvisation to occur. In the literature, this aspect is often combined with learning, and improvisation can be considered as a non-formal type of learning - as a process that involves the discovery, retention and exploitation of stored knowledge (Boudreau & Robey, 2005; Miner, Bassof & Moorman, 2001; Moorman & Miner, 1998).

We contributed to the understanding of organizational improvisation in three ways. First, by considering the factors that may influence expert and novice behavior and, consequently, the triggering of improvised actions in organizations. Second, as organizational improvisation is considered a potentially effective mechanism for organizations to survive in complex and turbulent environments, the development of these four propositions and their further empirical testing can help to better understand the potential of expert and novice behaviors in organizational settings and help to facilitate more effective organizational improvisation.

Although the influence of some of the variables presented here may not have a linear and positive effect on the triggering of improvised behavior by experts, the ultimate mixed effect of these variables will probably confirm the general expectation that experts will more often use improvised behavior, since the combination of their characteristics and especially the ability to interchange knowledge between tasks will induce this type of behavioral response to the environmental pressures that organizations face. When rules

are acquired, people with the adequate levels of self-efficacy will apply them to the situation (Dreyfus & Dreyfus, 2005).

Finally, we sought to contribute to the work and organizational psychology literature by suggesting that unexpected events may be approached differently by experts and novices. We have found that the factors that positively affect improvisation in experts may have negative consequences in novices and vice-versa (see Table 1). This is an important conclusion, for both theory development and practical

TABLE 1
Explaining the Differences between Experts and Novices in Terms of Improvisational Behavior

	Experts	Novices
Knowledge	Positive effect: Fast-paced responses to specific situations and guidelines adjustments to improve efficiency.	Negative effect: Time consuming actions in search of support in decision making.
Information-processing	Negative effect: Tendency to overemphasize the benefits of known solutions.	Positive effect: Broader information collection that can lead to the development of improvisational action.
Approaches to Problem-solving	Positive effect: Keeping hypothesis open allows experts to contemplate a broad spectrum of solutions and decide according to error minimization. Negative effect: Application of previous knowledge and tested solutions.	Positive effect: Development of new solutions to problems.
Task structure	Positive effect: Knowledge repertoire allows them to interchange knowledge among tasks and pay attention to details otherwise considered irrelevant.	Negative effect: Inability to act.

application. Organizational improvisation practices are facilitated by expertise although a gap may exist in expert performance related to information processing mechanisms. In teams comprising experienced and less experienced individuals, novices have the potential to assist experts to enhance their performance by filling in the gap. In addition, novices can only evolve along the expertise continuum if they are exposed to expert-like performance in order to learn from different approaches to the same situation and to different ways of dealing with the same information.

Several limitations can be pointed out to this text, including the lack of research on expert and novice behavior in the context of improvisation. The model that we have presented needs to be empirically validated. Variables not considered here may also be important. We are aware that if, as an example, different problem-solving features (e.g., resources, affect, heuristics, and monitoring) were included, it might have changed the overall tendency of the use of improvisation by experts and novices. The same is true for moderating variables such as cultural factors (e.g., Hofstede's cultural categories), situational factors (e.g., job characteristics), and personality factors (e.g., openness to experience, locus of control, and self-efficacy). It is also possible that improvisation in some fields differs from the same type of practice in other fields (e.g., medical emergency vs. new product development). Hence, the relevance of empirical research on the topic, both of the qualitative and quantitative types, in order to develop theory and test findings obtained in other contexts. The potentially relevant interaction between expertise and improvisation indicates the need for research in this area.

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