Review

How experts deal with novel situations: A review of adaptive expertise

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ABSTRACT

Adaptive expertise allows individuals to perform at a high level in the face of changing job tasks and work methods, setting it apart from routine expertise. Given the increased need for flexibility in the workplace, adaptive expertise is increasingly important for today's graduates and professionals. This review investigates which individual and environmental factors distinguish adaptive expertise from routine expertise and thus provides insights into how to facilitate adaptive expertise and its development. Key differences between routine and adaptive expertise are related to knowledge representation, cognitive and analogical problem solving abilities, and past experiences. Learning and working environments, which give individuals the responsibility to develop their own solution strategy and have supportive superiors benefit adaptive expertise. The results of our review also indicate that there is little consensus on the degree of adaptation adaptive expertise provides and the characteristics of a novel situation.

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1. Introduction

Today's work environments are characterized by increasing complexity due to higher levels of required knowledge and task volatility (Howard, 1995; Molloy & Noe, 2009; Tannenbaum, 2001). It is no longer sufficient to be an expert in one domain, but employees need to be able to combine different specializations (Pink, 2006), adapt to changes in their domain (Smith, Ford, & Kozlowski, 1996), and develop their expertise and become proficient in other domains (van der Heijden, 2002). In short, they must be able to deal effectively with novel situations and problems. Therefore, flexibility at the work-place becomes a critical ingredient for career success (van der Heijden, 2002). While some people quickly overcome changes in work requirements by inventing new procedures and using their expert knowledge in novel ways (Hatano & Inagaki, 1986; Holyoak, 1991), others do not possess this ability and find themselves thrown back performing as a novice. This ability to quickly get accustomed to change has been called adaptive expertise (Hatano & Inagaki, 1986).

Adaptive expertise is generally seen as important, but its characteristics and development are ill understood. Achieving a better understanding of the concept of adaptive expertise is necessary to design learning activities that contribute to its development. Therefore, the aim of this systematic review is to establish what the characteristics of adaptive expertise are and with which training and task characteristics it flourishes. By analyzing the characteristics that distinguish adaptive expertise from routine expertise, it will become possible to deduct what learning activities lead to it.

Hatano and Inagaki (1986) first coined the term adaptive expertise and contrast it with routine expertise. They conceptualize that both types of expertise comprise the same *extent* of domain knowledge and the ability to perform flawless in familiar situations. However, the difference becomes apparent once confronted with an unfamiliar situation: A situation in which the task, method or desired results are not known in advance (Ellström, 2001). While individuals with routine expertise struggle with the new demands, adaptive expertise allows for easily overcoming the novelty and quickly regaining a high level of performance thanks to a knowledge representation which allows for flexibility (Schwartz, Bransford, & Sears, 2005). In contrast to routine expertise, individuals with adaptive expertise possess the knowledge of why and under which conditions certain methods have to be used or new methods have to be devised.

Various authors studying adaptive expertise have provided numerous descriptions with features that fall apart in three groups. First, adaptive expertise entails all the basic components of routine expertise (e.g., Fisher & Peterson, 2001; Hatano & Oura, 2003; Martin, Rivale, & Diller, 2007; Mylopoulos & Woods, 2009; Varpio, Schryer, & Lingard, 2009). Second, adaptive expertise is marked by better developed meta-cognitive skills than routine expertise (e.g., Crawford, Schlager, Toyama, Riel, & Vahey, 2005; Martin, Petrosino, Rivale, & Diller, 2006). Third, adaptive expertise is set apart through abilities such as flexibility, ability to innovate, continuous learning, seeking out challenges, and creativity (e.g., Barnett & Koslowski, 2002; Crawford et al., 2005; Hatano & Oura, 2003; Martin et al., 2006, 2007; Mylopoulos & Scardamalia, 2008; Varpio et al., 2009). These characteristics point to two important facets of adaptive expertise. Firstly, it develops out of routine expertise. This is based on the first characteristic and implies that both forms of expertise are observable through accurate and efficient performance on domain-relevant and familiar tasks. It is postulated that individuals with routine expertise maintain their performance but halt their learning (Chi, 2011) and thus do not further develop into the stage of adaptive expertise. Secondly, Hatano and Inagaki (1986) suggest that adaptive expertise is after all domain-dependent because it is through accumulated experiences that adaptive expertise develops. In line with this conceptualization, researchers typically define the situation in which adaptive expertise is beneficial over routine expertise as changes in work and/or job task requirements (Allworth & Hesketh, 1999; Blickle et al., 2011; Griffin & Hesketh, 2003), changes in the complexity of situations (Chen, Thomas, & Wallace, 2005), changes from usual to unusual situations (Joung, Hesketh, & Neal, 2006), or changes from common to exceptional situations (Neal et al., 2006).

The focus on 'change' distinguishes research on adaptive expertise from research on expert performance. The latter type of research tries to identify individuals who perform on a superior level on tasks representative for their domain (Ericsson, 2007; Ericsson & Towne, 2010). Through analysis of their performance on *standardized* tasks it is possible to identify abilities of experts within a domain. In contrast to expert performance research, the tasks with which to analyze adaptive expertise are not standardized tasks within the experts' domain, but *novel* tasks within or even outside their domain. Research on adaptive expertise should thus not be placed within the research tradition of expert performance research. While this research is moving away from its classical focus on chess players, musicians and sportsmen, it still focuses on analyzing the performance of individuals who have achieved a sustainable and observable streak of top performance on standardized tasks within their domain.

Research on professional expertise distinguishes itself from traditional expertise research by perceiving expertise as a developmental process observable through the problem-solving skills of individuals (Tynjälä, Nuutinen, Eteläpelto,