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Reinforcing inspiration for technology acceptance: Improving memory and software training results through neuro-physiological performance

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ABSTRACT

This paper investigates the phenomenon of reinforcing inspiration for technology acceptance by improving memory and software training results Neuro-physiological performance. Monitoring of cortisol levels provided feedback for a decision support system that measured errors and elapsed time for training tasks completed by end-users of a health care application. The training success was measured utilizing statistics, SEM and a Fuzzy approach. The predictive model was implemented by comparing the regression, fuzzy logic and SEM results. Data collected from 338 health care workers were used to test a proposed model that inspiration, memory, and inspirational memory affect end user intention to adopt a digitized patient record software application. Structural equation modeling showed that, as expected, inspiration affected the individual behavior of the end users. Inspiration had an interactive impact through memory on collective acceptance of the technology, thereby affecting subsequent evaluations and behavior. The proposed model was nomologically validated through the use of a portable platform loaded with software for the electronic collection of operational-level health care data. Embedded metrics measured participants' memory as operationalized by task completion time, number of errors, and completeness of the data. In order to triangulate the results, salivary cortisol levels collected from 74 health care workers were used to measure whether inspiration improves memory and affects end user intention to adopt the application through reduced errors and decreased completion times. This paper contributes to the literature by introducing inspiration as a key driver that improves memory to affect end user intention to use digitized patient record technology.

1. Introduction

Recent cognitive absorption studies have begun to utilize bio-signal, and neurophysiological approaches to study enactive training effects (Léger, Davis, Cronan, & Perret, 2014; Randolph, Borders, & Loe, 2013). However, no attention has been paid in these models to inspiration. In fact, emotion is often viewed as having a negative impact on technology acceptance through fear of the software application and anxiety surrounding its use. We argue that not only do attitude, perceived behavior controls, and social norms influence intention to adopt technology, but inspiration and memory effects can be measured by salivary cortisol levels. The current study aimed to determine whether inspiration can be manipulated and, if so, how increased inspiration affects both memory and the situational motivation of end users to accept new technology. The present paper hypothesizes that inspiration positively influences intention to use technology, that memory, as measured by decreased time to complete a test script after being exposed to an inspirational stimulus, positively influences intention to use technology, that memory, as measured by decreased number of errors in the completed script after being exposed to an inspirational stimulus, positively influences intention to use technology and that these phenomenon are directly related to salivary cortisol levels of the end user trainees. The proposed study hypotheses were examined via parametric statistical analysis including descriptive statistics, pair-wise comparison of means, correlation and linear regression. Of data collected from 74 end users who were divided into a control group and an "inspired" group who received a pep talk and video "I'm an IBMer". Statistical, SEM and Fuzzy approaches are examined and used to triangulate the data. The rest of the paper will present a comprehensive literature review and analysis of these hypotheses.

Charnes, Cooper, and Rhodes introduced the idea of comparing efficiencies of different decision-making units. We use three techniques in this study. The first utilizes the fuzzy technique to determine cortisol and inspiration levels as measured by time and

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errors. Bhaskar, Pal, and Pal (2011) used a heuristic method for a resource-constrained project scheduling problem with fuzzy activity times that we adapt to determine whether an increase in cortisol levels leads to decreases in errors and decreases in time to complete training tasks with a corresponding increase in inspiration in a reinforcing and an upward spiraling manner. The second is statistical approach utilizing regression and descriptive insights. The third is the SEM, which has been used in the past to predict behavioral perspectives.

The integrative framework of technology use (IFTU) posits that to fully explain post-technology adoption phenomena, one must consider reason-oriented action, sequential updating, feedback, and habit in a unified model (Kim & Malhotra, 2005). Although the IFTU sheds light on the four mechanisms underlying technology use, it lacks a coherent theoretical explanation for the underlying force that leads to these mechanisms. Kim (2009) recently extended the IFTU by applying the process model of memory in cognitive psychology to the technology acceptance model (TAM). Yet even this extended IFTU fails to consider the role of memory and inspiration in technology use. The present paper contributes to the literature by proposing a model that takes into account the roles of inspiration, physical measures of memory (i.e., time to complete a script and number of errors), and the measurement of salivary levels of cortisol.

Empirical results from research on information technology acceptance suggest that attitude and subjective norms may have a nonlinear relationship with technology acceptance (Titah & Barki, 2009). According to the TAM, ease of use and usefulness are two primary determinants of behavioral intention and usage (Agarwal & Prasad, 1999; Davis, 1989; Doll, Hendrickson, & Deng, 1998; Subramanian, 1994; Venkatesh, 2000; Venkatesh & Bala, 2008; Venkatesh, Morris, Davis, & Davis, 2003). A parallel research stream emphasizes voluntariness, a key social influence and contextual variable, as a critical factor in information technology adoption, but pays little attention to its role in TAM (Wu & Lederer, 2009).

1.1. Literature review

Recent scholarship in mainstream psychology has advanced the study of inspiration (Hart, 1998; Thrash & Elliot, 2003, 2004); however, this psychological construct has yet to be explored in terms of technology acceptance. Inspiration has been conceptualized as an experience that (1) implies motivation, (2) is evoked and not initiated directly, and (3) involves transcendence of one's usual abilities (Thrash & Elliot, 2003). Trait inspiration involves individual differences in the ability to experience inspiration and relates to several personality traits, including openness, absorption, positive effect, work mastery, creativity, and optimism (Thrash & Elliot, 2003). State inspiration involves two component processes: being "inspired by" and being "inspired to." "Inspired to" embodies the notion that one is moved to act on a feeling of motivation, whereas "inspired by" measures whether one is inspired by a stimulus (Thrash & Elliot, 2004). In other words, the "inspired by" component recognizes the presence of inspiration but not necessarily the tendency to act on that inspiration. Compared to "inspired by," "inspired to" is positively related to responsibility and approach motivation (Thrash & Elliot, 2004). Furthermore, the two processes have different antecedents: "inspired by" implies transcendence and denial of responsibility (e.g., inspiration from a beautiful image), whereas "inspired to" implies motivation evoked from an external source that spurs one to act toward a certain goal (Thrash & Elliot, 2004). In terms of technology acceptance, researchers assume that managers or leaders can inspire end users to perform a certain action (i.e., "inspired by").

The terms motivation and inspiration are often used interchangeably. However, motivation is the regulation, direction, and energy behind one's behavior (Roberts, 2001), whereas inspiration is an evoked sense of energy from a source that implies motivation. In other words, inspiration is an external stimulus that may influence motivation or facilitate self-determined motivation and autonomy (Thrash & Elliot, 2004). For example, software developers sometimes point to inspiration as a source of end user motivation (e.g., when describing trainers who deliver inspirational speeches to motivate end users). Moreover, in qualitative research on the experience of and meaning ascribed to inspiration, participants differentiated inspiration from motivation, stating that they were not the same experience (Hart, 1998). These findings provide initial support for differentiating inspiration from motivation and clarifying it as a unique construct in the literature. Of particular interest is whether inspiration can increase situational motivation. To date, no one has studied whether inspiration actually increases autonomous motivation. Correlations have been made (Thrash & Elliot, 2003, 2004), and implications for motivation changes have been offered (Burleson, Leach, & Harrington, 2005; Lockwood & Kunda, 1999), but the true test of a variable is its manipulation. According to Thrash and Elliot's conceptualization, inspiration is evoked and implies motivation. An inspirational stimulus evokes a response and provides energy toward a goal. Being "inspired to" do something empowers individuals, giving them a feeling of control over their actions, which is the essence of autonomy. Individuals who are "inspired to" may thus experience satisfaction of the need for autonomy (Deci & Ryan, 1985). Therefore, it is possible that increases in perceived inspiration could be associated with increases in situational autonomous motivation.

Blascovich and Bailenson (2011) point out that "cyberpsychology is the study of the human mind and its behavior in the context of human interaction and communication of both man and machine, further expanding its bounds with the culture of computers and virtual reality that take place on the internet." The biology of memory is not a new or emerging field, and acts as a subset of the evolving cyberpsychology discipline. Therefore, a condensed and efficient amount of information is presented in order to remind the reader of the biochemistry factors that are behind the behavioral human computer interaction. By no means is this meant to be an exhaustive review of the biology of memory literature. Rather, it is a taste, to wet the reader's appetite, should a less parsimonious appraisal of this field be desired in order to understand these communications of man and machine.

Wichmann, Fornari, and Roozendaal (2012) point out that emotional memory enhancement is a well-recognized phenomenon that helps us to remember important life events. Bradley, Greenwald, Petry, and Lang (1992) and McGaugh (2006) propose that both positive and negative emotionally arousing experiences are more likely to be recalled with greater detail and vividness than events that lack emotional significance. However, studies investigating the neural mechanisms underlying arousal-induced memory enhancement have focused almost exclusively on negatively motivated experiences. Such studies indicate that glucocorticoid hormones (corticosterone in rodents, cortisol in humans), released from the adrenal cortex during arousing episodes, are crucially involved in facilitating the consolidation of long-term memory of these experiences (Abercrombie, Speck, & Monticelli, 2006; Okuda, Roozendaal, & McGaugh, 2004; Roozendaal & McGaugh, 2011; Schwabe, Joëls, Roozendaal, Wolf, & Oitzl, 2011). Corticosterone or specific glucocorticoid receptor (GR) agonists are known to act upon different loci within the emotional memory network, including the basolateral amygdala, hippocampus and various cortical regions, to enhance memory consolidation of training on a wide variety of aversively motivated learning tasks (Fornari, Wichmann, Atucha, et al., 2012; Miranda, Quirarte, Rodriguez-Garcia, McGaugh, & Roozendaal, 2008; Quirarte et al., 2009; Roozendaal, de Quervain, Ferry, Setlow, & McGaugh, 2001;