Neuroscience and a Nomological Network for Understanding Emotions in Information Systems Research

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The understanding of human emotions in online activities including e-commerce, information acquisition, decision making, and social networking is increasingly of interest to information systems (IS) research and practice. A number of studies have tackled the issue of online emotional experiences, such as exploring the role of "pleasantness" for designing web interfaces (Deng & Poole, 2010), and applying the construct of "enjoyment" to investigate online users' intention of using interactive technology (Lin & Bhattacherjee, 2010). Further, the advent of neuroscience techniques in IS research promises new and exciting means for understanding and assessing constructs such as human emotions (Dimoka, Pavlou, & Davis, 2011).

Theories of emotion, however, offer a very complex view of human emotional sub-systems, emotional states and how emotions can be measured. Measures of emotions across different systems (e.g., language and physiological) do not necessarily converge and even multiple measures within a system give response discordance (Larsen & Prizmic-Larsen, 2006). Further, an understanding of emotional responses should be linked to the specific domain of concern (see Richins, 1997). In the interests of research rigour, the methods and instruments developed and used to appraise emotions in IS, especially with novel neuroscience methods, need to have a firm theoretical base so that they are fit for purpose and have validity in the IS research context.

This study aims to facilitate understanding of emotion-linked constructs in IS research within a nomological network. A nomological network shows the constructs of interest in a domain of study, how these constructs are manifested and measured and the "lawful" linkages amongst constructs. The development of such networks is deemed necessary for construct validity (Cronbach & Meehl, 1955) and is an indispensable ingredient for sound theory development.

Three experiments were conducted to investigate models based on the underlying nomological network, with a multi-method approach to the assessment of emotions. The methods used for measurement address subjective experience (self-report) and physiological (electro-encephalography, EEG) responses. Two emotions, *happiness* and *fear*, are selected in investigations as they have been implicated in prior studies of online commerce (Hwang & Kim, 2007; Li, Sarathy, & Xu, 2011).

Simulated web pages for the experiments were developed with different experimental conditions involving neutral, positive and negative emotion inducement. The web pages differed in terms of the images they incorporated. To increase nomological validity, the images used were taken from the International Affective Picture System (IAPS) (Lang, Bradley, & Cuthbert, 2008). These images have been extensively tested and norms established for their usage in terms of emotions elicited.

The study develops a number of theory-based models that link stimuli, various measures of human emotions and expected behavioural outcomes in a nomological network. These models are used to assess convergent, discriminant, predictive, and nomological validity of diverse measures. As applying multi-method approaches to measure and understand human emotions in IS research is still at an early stage, we believe that great care is needed in choosing one or more measurement approaches in any specific IS study, particularly with novel neuroscience measures. The study contributes by highlighting how the understanding and assessment of emotions in IS can be improved by considering the emotions within a nomological network.

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