Journal of Enterprise Information Management

Interplay of cognition and emotion in IS usage: Emotion as mediator between cognition and IS usage

Inju Yang Bouchaib Bahli

Interplay of cognition and emotion in IS usage

Emotion as mediator between cognition and IS usage

Inju Yang
EDC Paris Business School, Paris, France, and
Department of Information Systems,
ESC Rennes School of Business, Rennes, France, and
Bouchaib Bahli
Department of Information Systems,
ESC Rennes School of Business, Rennes, France

Received 13 December 2013
Revised 25 June 2014
2 October 2014
Accepted 17 October 2014

Abstract

Purpose – The purpose of this paper is to demonstrate the effects of emotion as outcomes of cognition, in turn influencing levels of information system (IS) usage at work. In doing so, the author presents set of propositions illustrating an integrated model by adapting both cognitive and affects aspects to explain continuance of IS usage.

Design/methodology/approach – This conceptual paper explains the importance of cognitive judgement to IS usage via emotional lenses. Based on literature covering the concepts of technology adaptation theory, emotions, as well as the theoretical foundations in cognitive appraisal, the author has examined the relationship between cognition and IS usage with mediating emotion.

Findings – Propositions based on literature review of cognition and emotions in IS research are presented for further empirical study. The author argues that by connecting cognitive judgement and emotional reactions on IS, both ease of use and usefulness should be considered in designing IS as to how these may generate positive or negative emotions.

Research limitations/implications – As the success of IS depends on the users' continued use of the system, an integrated model adapting both cognitive and affects aspects will be better equipped to explain continuance of IS usage.

Practical implications – Good IS design could influence not only the effectiveness of IS but also the emotional well-being of employees.

Originality/value – This is one of the first studies to consider together the impact of the cognitive and affective processes leading to IS continuance in one model. This is one of the first studies in which one single model is used to consider together the impact of the cognitive and affective processes leading to IS continuance. Thus, the author contributes to IS continuance literature as well as employees' well-being literatures given how IS is embedded in today's working organization. The author also believes the model will stimulate more comprehensive understanding of IS continuance as IS users are considered as human beings with both cognition and emotions.

Keywords Perceived ease of use, Information system, Perceived usefulness, Positive emotion, Negative emotions

Paper type Conceptual paper

Corrigendum

It has been brought to our attention that Bouchaib Bahli was not named as an author of "Interplay of congnition and emotion in IS usage: emotion as mediator between cognition and IS usage" which was published in the Journal of Enterprise Information Management, *Vol. 28 No. 3, pp. 363-376. This occurred through an author error. The authors sincerely apologise for this. The additional author attribution for this article has now been added to the electronic version of the article.*

Journal of Enterprise Information Management
Vol. 28 No. 3, 2015
pp. 363-376

1741-0398
DOI 10.1108/JEIM-12-2013-0092

Every day we engage with various information systems (ISs) at work, including e-mail and intranet, to communicate, to be informed, and to achieve goals. Organizations depend on IS for the execution of a variety of operational, tactical, and strategic processes (Applegate *et al.*, 2003). However, despite substantial organizational interest and therefore investment in IS, the degree of IS usage amongst organizational members still varies significantly. It is even claimed that, in general, IS investments do not always lead to better organizational outcomes (Roberts and Henderson, 2000) and and over 90 per cent of costs related to IS are attributable to the post-implementation stage (Erlikh, 2000). Consequently, both academics and practitioners have much interest in discovering the determinants of IS usage. With the popular technology acceptance model (TAM) (Davis, 1989), which is broadly based on perceived usefulness (PU) and perceived ease of use (PE) from past experience, there has been a general agreement on the cognitive aspects of IS use (Bhattacherjee and Sanford, 2006; Liao *et al.*, 2007; Roca *et al.*, 2006). However, the prominent core of rationalized professional and academic knowledge within the IS field has frequently been shown as inadequate to cope with the complexity of particular IS projects (Avgerou, 2002; Ciborra, 2002; McGrath, 2006). Given that our behaviours are determined not only by cognition but also by emotion, consideration of the affective aspects of IS usage could provide a more complete picture of these determinants.

With recognition of the role of affect in human behaviours, there has been much interest in looking at affective (or emotional) aspects of the use of technology (cf. Gregor *et al.*, 2014; Kim *et al.*, 2007; Zhang and Sun, 2009). Recent research on emotions in IS literature have shed some light on how emotion influences IS users. For example, anxiety has been found to be negatively associated with initial appraisal of information technology (IT) system (e.g. Beaudry and Pinsonneault, 2010; Venkatesh, 2000). However, even though these studies have demonstrated the influence of single discrete emotions on IS use, especially for changes in IS, how positive emotions and negative emotions in general influence continued IS continuance usage is still not clear. Moreover, extant studies have considered discrete emotions in a stand-alone context without incorporating cognition in their frameworks (e.g. Beaudry and Pinsonneault, 2010). It is true that some studies have made an attempt to combine affective and cognitive aspects by adapting a range of different labels from aesthetics, satisfaction, intrinsic motivation (or enjoyment) as affective aspects (e.g. Fagan *et al.*, 2008; Lindgaard and Dudek, 2003; Wen *et al.*, 2011). However, these notions are evaluations of emotions, rather than emotions *per se*.

These different labels and/or stand-alone approaches to considering the affective dimensions of IS have resulted in inconsistent conclusions and contradictory advice, suggesting weak effect for some studies and strong effect for others (cf. Zhang, 2013). Given the distinctive but interactive natures of cognition and emotion in individuals' attitudes and behaviours (cf. Avgerou and McGrath, 2005; Brief and Weiss, 2002), there is a need to investigate there effects on IS usage together. The integrative approach also allows us to understand the role of IS in employee's emotional experience. In particular, as IS (including intranets) underpins large portions of organization processes, as well as employees' experience of the organization, how IS influences employees' emotions could have significant meaning, not only concerning levels of IS usage but also for employee's general psychological well-being.

The prevailing orientation towards cognitive processes suffers from an inherent limitation owing to its one-dimensional focus on the rational aspects of human behaviour (cf. Choi *et al.*, 2011), and has thus failed to address the broader array of

theoretically meaningful emotions identified in the emotion literature. Therefore, the main objective of this paper is to demonstrate the effects of emotion as outcomes of cognition, in turn influencing levels of IS usage. Here, we attempt to understand continued use of IS or IS continuance (in contrast to initial use of IS or IS acceptance). We adapt cognitive appraisal and affective event theory (AET) and propose mediating roles of positive and negative emotions between cognitions and IS usage. With this framework, we aim to contribute to the literatures of IS continuance as well as of emotion. By considering both cognition and emotion, this paper offers more complete view towards IS use and, at the same time, further supports the significance of PE in IS design. Given the interest in emotions and embeddedness of IS in today's organizations, this paper also illustrates how both positive and negative emotions could be generated at work.

The remainder of the paper is organized as follows. We start the following section by examining notions of cognition, emotion, and IS use before proposing our model of IS use that integrates cognition and emotion. In this section we conduct literature review covering cognition and affect in IS research in an attempt to make connections between them so as to build propositions and the model presented in this paper. The paper ends with a discussion of contribution to research and practice, and suggestions for future research.

1. Cognition, emotion, and IT use intention

1.1 Cognition

Cognition (i.e. thinking) means the mental process of knowing, including aspects such as perception, reasoning, and judgement (Kim *et al.*, 2007). Dominant IS research has been guided by rationalism or rational decision making (cf. McGrath, 2006). In this regard, the TAM is arguably the most popular and effective model used to predict IS usage in both acceptance and continuance. TAM posits that IS usage can be explained by two cognitive beliefs: PU and PE. PU encompasses beliefs concerning instrumental outcomes associated with technology use, and PE encompasses beliefs that technology use will be relatively free of cognitive burden. TAM is grounded on the theory of reasoned action (TRA) where attitudes, influenced by beliefs, lead to intentions and thereby to behaviours (Fishbein and Ajzen, 1975). Research on TAM has suggested that PE may influence PU, but not vice versa (Davis, 1993; Davis *et al.*, 1989), however, as a predictor of user acceptance, PU has been the strongest across a diverse area of research settings at the expense of PE (e.g. Taylor and Todd, 1995; Venkatesh and Davis, 2000).

Despite its popularity, TAM has been perceived to be a barrier to the success of ISs, sometimes leading to perplexing findings, especially for the study of continuing IS usage (Ortiz de Guinea and Markus, 2009). There are differences between initial adoption of IS and IS continuance. One of these differences is that continuance is salient when the user has accumulated usage experience of the target system, and affective reaction from direct experience often becomes stable over time (Schelling, 1984). However, cognition-based TAM seldom explores the feedback effect (Lin *et al.*, 2011). Even though TAM provides a reasonable foundation for consideration of the external factors (cognitions) that affect acceptance (Amoako-Gyampah, 2007), it misses out on the internal factors (emotions) that affect attitude formation which in turn play an important role in determining users' IT system continuance intention (Thüring and Mahlke, 2007).

1.2 Emotion

Human behaviour is affected not only by rational and cognitive processes, but also by emotional processes that can often be irrational (Brief and Weiss, 2002; Huy, 2002).

Emotions play a powerful and central role in our lives. They influence our beliefs and attitudes and they help guide our thinking, decision making, and actions (Gratch and Marsella, 2004; Lazarus and Folkman, 1984). It is therefore necessary to investigate how IS users' emotions emerge and drive their actions.

Affect has been defined variously in the literature. It is generally understood to comprise a class of mental phenomena characterized by a consciously experienced, subjective feeling state, commonly accompanying emotions and moods (Parkinson, 1995). The term emotion is used to specify feelings towards an event, object, or a person (Frijda, 1986). On the other hand, the term mood is used to imply feelings that cannot necessarily be linked to a particular event, object, or a person. Despite these subtle differences, affect and emotion are used interchangeably quite often, and we will not differentiate these terms in this paper.

Following theories of affective influence on choice and judgement, we take a valence-based approach which contrasts the effects of positive vs negative feeling states or emotions. While discrete emotions do not demonstrate emotion-consistent and emotion-specific directional changes (Lindquist *et al.*, 2013), valence remains the organizing principle for emotion effects on judgement and decision making (Elster, 1998; Forgas, 2003). Valence-based approaches predict that distinct emotions of the same valence exert similar influences on judgement and choice. Moreover, valence-based approaches serve the purpose of parsimony (cf. Higgins, 1997) which suits our exploration of the overall relationship between cognition, emotion, and IS usage. There is robust evidence for emotional dimensions of valence in organizationally relevant attitudes such as job satisfaction, commitment, evaluation of consumer goods (Clore *et al.*, 1994; Forgas and George, 2001).

1.3 IS use intention

Motivation to perform behaviour is labelled behavioural intention. Behavioural intention is the person's subjective probability that he/she will perform the behaviour in question (Fishbein and Ajzen, 1975) and a person who intends to take a certain action is likely to carry out that behaviour. TRA (Fishbein and Ajzen, 1975) states that attitudes, influenced by beliefs, lead to intentions and thereby to behaviours. In the same vein, a great deal of research on IS shows that TAM retains its robustness even without including behavioural attitude, since behavioural intention is largely explained by beliefs (cf. Chea and Luo, 2008). Therefore, we consider IS use intention as an indication of user's behaviours.

2. A framework for mediating emotions between cognitions and IS usage

In this paper, we propose a model highlighting the mediating role of emotion between cognition and IS use intention. To illustrate this mediating relationship, we follow Baron and Kenney's (1986) three steps to explain: first, independent variable to dependent variable (cognition to IS use); second, independent variable to mediator (cognition to emotion); and third, mediator to dependent variable (emotion to IS use).

2.1 Linking cognition to IS use intention

TAM suggests that two specific cognitions, PE and PU, determine one's behavioural intention to use a technology, which has been linked to subsequent actual behaviour (cf. Sheppard *et al.*, 1988). The underlying objective of PE is to predict usage behaviour although it is associated with intention in TAM. There is a significant body of research supporting the importance of PE on both initial user acceptance and sustained usage of systems (Bhattacherjee and Sanford, 2006; Venkatesh, 1999). PE has also been shown to be an important factor influencing attitudes towards behaviour (Shih, 2004;

Barkhi and Wallace, 2007). Post-adoptive intentions derive from an individual's understanding both of how to use an application's features and how these features complement other work system elements (Jasperson *et al.*, 2005).

Some empirical studies comparing the relative effects of PU and ease of use during pre-acceptance and post-acceptance stages of IS use report that PU impacts attitude substantively and consistently during both stages of IS use; and PE has an inconsistent effect on attitude in the initial stages, which seems to further subside and become non-significant in later stages (e.g. Davis *et al.*, 1989; Karahanna *et al.*, 1999). This is because when users gain experience with the system, ease of use concerns seem to be resolved and displaced by more instrumental considerations involving the efficiency of the innovation to increase one's job performance (i.e. PU) (Karahanna *et al.*, 1999). However, other studies show that PU does not have a direct significant impact on continuance intention in the e-learning and e-shopping contexts (e.g. Lin *et al.*, 2011; Shih, 2004). PU is influenced by PE as the easier a technology is to use, the more useful it can be (cf. Bhattacherjee and Sanford, 2006).

These studies illustrate that cognitive beliefs of PE and PU could lead to IS use intention, although relative effects of PE and PU towards IS continuance is not clear.

2.2 Linking cognition to emotion

The predominant theoretical model of emotion in the literature is, in essence, a model in which cognitions lead to emotions which in turn predispose or motivate the individual towards particular behaviours (Roseman *et al.*, 1994; Weiner, 1986). Emotions are conceived as experienced states arising out of cognitive appraisal and assessment of circumstances (i.e. the rational hierarchy of effects: cognition as the driver of emotion; Lazarus and Folkman, 1984; Roseman *et al.*, 1990). As emotions or affects are psychological states that entail an evaluative component (Bagozzi *et al.*, 1999), emotion often constitutes background to consciousness and to other mental states (Kelly and Barsade, 2001; Lazarus, 1991).

Within such cognitive processing of emotion, the notion of appraisal, or the assertion that "emotion is a response to meaning", is a core component of most theories (Lazarus, 1999; Parkinson, 1997) as emotional experiences occur as a result of an individual's appraisal or evaluation of the likely impact of an event for their goals. While outcome dependent emotions of being up or down could occur as a result of success or failure, these global emotions also give rise to attribution-linked emotions that are produced as a consequence of cognitive attempts to interpret and make sense of the source of global emotions. On the basis of an appraisal of their positive or negative consequences, a process of "causal attribution" focuses a specific emotion on a particular social object identified as the cause of the emotion (Hewstone 1989). Similarly, AET (Weiss and Cropanzano, 1996) illustrates that mood and emotions flow from discrete affective occurrences such as job and task characteristics/design, reward systems and performance feedback.

Taking these approaches together, we could expect that IS users can cognitively evaluate a system's ease of use and usefulness and subsequently form affective responses. In other words, even though PE and PU may not be affective events *per se*, cognitive evaluations of daily use of IS systems will give rise to emotions towards those systems. Research has shown that actions demonstrating a person's control, efficacy, self-determination, or mastery over the environment produce positive emotions (Deci, 1975; Izard, 1977; Kemper, 1978). For example, empirical studies show that efficacy beliefs including self-efficacy influence positive affects over time (e.g. Salanova *et al.*, 2011); on the other hand, insufficient goal attainment is associated with negative emotions and progress towards goal attainment is associated with positive emotions (Martin *et al.*, 1993).

Given PE taps into the self-efficacy dimension and PU captures the instrumentality of IS use (cf. Bhattacherjee, 2001), we would expect that high PE should generate positive emotions whereas low PE should generate negative emotions. At the same time, high PU should also generate positive emotions and low PU should generate negative emotions. Similarly, a low degree of novelty (which is related to PE) is associated with more positive emotions (cf. Thüring and Mahlke, 2007); and the more useful a technology (which is related to PU) lower the anticipated negative emotions (cf. Connolly and Zeelenberg, 2002; Pieters and Zeelenberg, 2005).

2.3 Linking emotions to IS use intention

Emotional valence has substantial implications for individuals' motivation and subsequent behaviour (Frijda, 1986; Lazarus, 1991). People are motivated to understand the sources of these feelings because they want to reproduce good feelings and avoid bad feelings in the future (Lawler *et al.*, 2000). In addition, while proposing both causes and consequences of momentary mood and emotions at work, AET proposes that events produce positive or negative emotions which, in turn, directly shape work attitudes and judgement-driven behaviours. Emotional responses lead either to approach or avoidance behavioural intention (Kim *et al.*, 2007).

In the IS literature on continuing IT use, scholars seem to agree that emotion is an input to the formation of conscious behavioural intentions to continue (or not to continue) using IT (cf. Ortiz de Guinea and Markus, 2009). A set of affective or emotional responses are related to the use of technology (cf. Chea and Luo, 2008; Kim *et al.*, 2007). For example, the evidence indicates that emotions, such as anxiety in using computers, general computer playfulness, or affect towards computers, influence users' attitudes and use of specific IT (e.g. Compeau *et al.*, 1999; Venkatesh, 2000). Similarly, negative computer incidents were found to be the primitive cause of a user's discontinuance behaviour (Lin *et al.*, 2011).

Therefore, we could expect that positive emotions from PE and PU should lead high levels of IS use intention whereas negative emotions from PE and PU should lead low level of IS use intention.

2.4 Research model and propositions

Thus far, we have illustrated how cognition of IS triggers both positive and negative emotions, and in turn, how these emotions influence subsequent user intentions. Based on the relationships that we have investigated so far, we have developed two sets of propositions below that create a series of bivariate relationships among the components of cognition, emotion, and IS continuance in our model. When combined, these propositions together suggest a mediated causal sequence, in which IS users' emotional reactions mediate the effects of cognitive evaluations on IS continuance. Figure A1 illustrates the model proposed:

P1a. High levels of PE will lead to high levels of positive emotion which in turn will lead high levels of IS continuance.

P1b. Low levels of PE will lead to high levels of negative emotion which in turn will lead to low levels of IS continuance.

P2a. High levels of PU will lead to high levels of positive emotion which in turn will lead to high levels of IS continuance.

P2b. Low levels of PU will lead to high levels of negative emotion which in turn will lead to low levels of IS continuance.

3. Discussion

In this paper, we have adapted cognitive appraisal framework incorporating both cognition and emotion towards IS continuance. This paper joins in the growing body of IS literature that emphasizes the importance of emotions by considering the fact that IS users' emotions influence their behaviours (e.g. Beaudry and Pinsonneault, 2010; Loiacono and Djamasbi, 2010; McGrath, 2006). Ciborra (2002) argues that we always act within an emotional medium. In this view, purely rational action is not possible and the relationship between rationality and emotionality (Avgerou and McGrath, 2005) should be explored to explain their consequences on IT use. Drawing on cognitive appraisal, this paper presents a new and comprehensive approach to existing stand-alone cognition- and affect-based models by studying emotion as a mediator between cognition and IS use intention. In doing so, this paper contributes to predicting IS continuance. No study has yet attempted to incorporate together the impact of the cognitive and affective processes leading to IS continuance. We argue that by connecting cognitive judgement and emotional reactions on IS, both ease of use and usefulness should be considered in designing IS as to how these may generate positive or negative emotions. Our model helps to explain why and how both PE and PU are important and lead to IS intention by explicitly stating mediating variables, emotions. By doing so, we contribute towards discussions within a more complete view so as to determine IS usage taking into consideration both external and internal causes of users.

This paper also contributes to growing discussions in affects in IS research by adapting positive and negative emotions rather than affects related notions such as satisfaction and attitudes. Even though only a small number of studies consider more than one affective construct in the same study, there has also been a lack of agreement on the names, labels, meanings, connotations, and even measures of affective concepts, resulting in inconsistent conclusions and contradictory advice for researchers and practitioners (cf. Zhang, 2013). Our adaptation of emotional variance contributes a more parsimonious model to the IS literature. Furthermore, while some of the recent research treat emotions as moderators between neurophysiological memory and behavioural belief in PE (i.e. Ortiz de Guinea *et al.*, 2014), we argue that emotions are directly generated from cognition and judgement on IS which eventually influence IS intentions. Our model could explain, for example, that low level of intentions of IS usage could be from negative emotions caused from low PE and PU, while high level of intentions of IS usage could be from positive emotions from high PE and PU, in which case it explains why PE and PU should be important in IS design.

3.1 Research and practical implications

The ways in which individuals use IS have been identified as critical for linking organizational investments with their corresponding benefits (Barua and Mukhopadhyay, 2000; Jasperson *et al.*, 2005) and this paper illustrates both high PE and PU would generate high levels of positive emotions and further high IS continuance and low PE and PU would give rise to negative emotions and further low IS continuance. The real challenges for IS design may be how to minimize the negative emotions which hinder this automatic task performance. In-depth studies adapting case studies and negative incident reports may yield further insight as to what gives rise to negative emotions towards IS.

In addition, our model suggests that considering PE and PU is important in designing IS at work, not only for the reasons of cognition but also emotions leading IS

continuance. As employees are emotional being, our model implies both PE and PU could also influence employees' daily emotions. Therefore, organization should pay attention to good IS design considering PE and PU not only for effectiveness of system but also users' emotional well-being. While Barki *et al.* (2007) claim that people use IT because it is instrumental in their tasks, most employees in today's organization do not have a choice but to use intranet and internal e-mails to perform and connected at work, even when IS triggers negative emotions such as frustration and anger. This may have further implications such as derailing employees' attention from their tasks as they try to manage their negative emotions. As negative emotions usually produce larger, more consistent, and long-lasting effects (Dasborough, 2006), the result can be the impairment of motivational and coordination processes in teams, lower pro-social behaviour, and lower group performance (George, 1990).

How ease of use is perceived by each IS user should also be further considered. Given the importance of actual behavioural experience as well as "anchoring and adjustment" in shaping the evolution of beliefs such as PE (Fazio and Zanna, 1981; Northcraft and Neale, 1987; Venkatesh and Davis, 1996), how do IS users anchor the level of easiness and usefulness? Subject's response to a judgemental task may be based on the subject's past experiences (cf. Helson, 1964) as an initial anchoring criteria in the early stages of user experience. Then, how PE (and PU) does evolve during direct experience of IS continuance? Further research on this issue would also be very useful.

As it may not always possible to achieve both PE and PU equally, future studies could examine which effect would generate stronger negative emotions. In relation to the relative effects of PE and PU on IS continuance intention, there have been contradictory findings in the literature (e.g. Lin *et al.*, 2011; Karahanna *et al.*, 1999; Shih, 2004). For example, while PU generates positive emotions, it may be a lot less significant than PE, indicating self-efficacy related PE is more important to make IS users to feel positive about IS, therefore leading to high levels of IS use intention. That is, IS should above all be easy to use and support employees in their day-to-day task execution. On the other hand, PU could be more impact in generating higher levels of negative emotion than positive emotion, suggesting that when IS is not perceived as useful, it will generate high levels of negative emotion. Empirically measuring both PE and PU relative to both positive and negative emotions would shed more light on these puzzling effects of cognition leading IS continuance.

3.2 Limitation and further thoughts

For the parsimony of the model, we have not considered reversal effects from emotions to cognition, even though it is possible to have continuous feedback loops between them during IS usage. For example, study shows possible reverse direction from emotions to cognition, in that when frustration is high, neurophysiological memory load has a negative effect on PE, whereas when it is low, neurophysiological memory load has a positive effect on PE (Ortiz de Guinea *et al.*, 2014). Furthermore, goal-directed behaviours mean that actions may not be consciously decided or planned (Ortiz de Guinea and Markus, 2009; Verkanplen and Orbell, 2003). If individuals are frequently performing a particular behaviour, this behaviour tends to become habitual over time (Gefen, 2003; Jasperson *et al.*, 2005) and the more behaviour is performed out of habit, the less cognitive planning it involves (cf. Hong *et al.*, 2008). While good IT design can trigger automatic IT usage allowing users to focus on their tasks (cf. Ortiz de Guinea and Markus, 2009), the subsequent positive emotions could be subsided to the unconscious level. In which case, positive and negative emotions should

be measured with a multiple measurement approach by both self-reports and neuroscience measures (e.g. Gregor *et al.*, 2014) to get better picture for IS continuance. In addition, given the embeddeness of IS in most organizations, future research should consider IT usage in relation to intensity, frequency, time length, and should actual log this data, as there will be different degrees of acceptances or utilization even when people have to use IT to perform their tasks.

Perhaps more importantly, we note that Ortiz de Guinea and colleagues express concerns in using TAM model for IS continuance as reasoned action of TAM may not provide the best theoretical foundation for the study of continuing IT use and cannot describe what happens during the utilization of a system (cf. Ortiz de Guinea *et al.*, 2014; Ortiz de Guinea and Markus, 2009; Ortiz de Guinea and Webster, 2013). We have adapted PU and PE leading to emotions as they are two of the most researched constructs in IS research and also for the reason of parsimony of the model, which allows a clear illustration between cognition and emotions. However, future research should incorporate feedback loops as well as IT events eliciting negative emotions motivating changes in actual behaviours (cf. Ortiz de Guinea and Webster, 2013).

4. Conclusion

In recognition of the importance of emotions as well as cognition in decision and behaviours of individuals, there has been growing interest and research on emotions in IS literature. Studies incorporating emotions in IS literature have mainly considered discrete emotions such as anxiety and comfort, focusing on temporal reaction to changes. Moreover, most studies considered emotion effects in isolation from cognition effects. Such approaches could miss out on opportunities to understand the dynamics between the cognitive and affective aspects of IS usage.

Given the fact that emotion and cognition co-exist in influencing IS usage, incorporating both emotion and cognition could give us a more comprehensive understanding of the drivers of IS usage. Therefore, adapting theories of cognitive appraisal and AET, we conceptually investigate the mediating role of positive and negative emotions between cognitions and IS usage. By incorporating both cognition and emotions in an overall framework connecting IS usage, this paper highlights the robustness and therefore importance of PE and PU in IS design. This paper discusses on a vital and topical subject area, i.e. mediating role of positive and negative emotions between cognitions and IS usage. An understanding of how emotions are generated from cognition towards IS could also assist the practical design of IS in an organization.

References

Amoako-Gyampah, K. (2007), "Perceived usefulness, user involvement and behavioral intention: an empirical study of ERP implementation", *Computers in Human Behavior*, Vol. 23 No. 3, pp. 1232-1248.

Applegate, L.M., Austin, R.D. and McFarlan, W. (2003), *Corporate Information Strategy and Management: The Challenges of Managing in a Network Economy*, McGraw-Hill, Boston, MA.

Avgerou, C. (2002), *Information Systems and Global Diversity*, Oxford University Press, Oxford.

Avgerou, C. and McGrath, K. (2005), "Rationalities and emotions in IS innovation", in Howcroft, D. and Trauth, E. (Eds), *Handbook of Information Systems Research: Critical Perspectives on Information Systems Design, Implementation and Use*, Edward Elgar, Cheltenham, pp. 299-324.

Bagozzi, R.P., Gopinanth, M. and Nyer, P.U. (1999), "The role of emotions in marketing", *Journal of the Academy of Marketing Science*, Vol. 27 No. 2, pp. 184-206.

Barkhi, R. and Wallace, L. (2007), "The impact of personality type on purchasing decisions in virtual stores", *Information Technology and Management*, Vol. 8 No. 4, pp. 313-330.

Barki, H., Titah, R. and Boffo, C. (2007), "Information system use – related activity: an expanded behavioral conceptualization of individual-level information system use", *Information Systems Research*, Vol. 18 No. 2, pp. 173-192.

Baron, R.M. and Kenny, D.A. (1986), "The moderator-mediator variable distinction in social psychological research – conceptual, strategic, and statistical considerations", *Journal of Personality and Social Psychology*, Vol. 51 No. 6, pp. 1173-1182.

Beaudry, A. and Pinsonneault, A. (2010), "The other side of acceptance: studying the direct and indirect effects of emotions on information technology use", *MIS Quarterly*, Vol. 34 No. 4, pp. 689-710.

Barua, A. and Mukhopadhyay, T. (2000), "Information technology and business performance: pass, present, and future", in Zmud, R.W. (Ed.), *Framing the Domains of IT Management: Projecting the Future…Through the Past*, Pinnaflex Educational Resources Inc., Cincinnati, OH, pp. 65-84.

Bhattacherjee, A. (2001), "Understanding information systems continuance: an expectation-confirmation model", *MIS Quarterly*, Vol. 25 No. 3, pp. 351-370.

Bhattacherjee, A. and Sanford, C. (2006), "Influence C. Processes for IT acceptance", *MIS Quarterly*, Vol. 30 No. 4, pp. 805-825.

Brief, A. and Weiss, H. (2002), "Organizational behavior: affect in the work place", *Annual Review of Psychology*, Vol. 53, pp. 279-307.

Chea, S. and Luo, M.M. (2008), "Post-adoption behaviors of e-service customers: the interplay of cognition and emotion", *International Journal of Electronic Commerce*, Vol. 12 No. 3, pp. 29-56.

Choi, J.N., Sung, S.Y., Lee, K.M. and Cho, D.S. (2011), "Balancing cognition and emotion: innovation implementation as a function of cognitive appraisal and emotional reactions toward innovation", *Journal of Organizational Behavior*, Vol. 32 No. 1, pp. 107-124.

Ciborra, C.U. (2002), *The Labyrinths of Information: Challenging the Wisdom of Systems*, Oxford University Press, Oxford.

Clore, G.L., Schwarz, N. and Conway, M. (1994), "Affective causes and consequences of social information processing", in Wyer, R.S. and Srull, T.K. (Eds), *The Handbook of Social Cognition*, 2nd ed., Lawrence Erlbaum Associates, Hillsdale, NJ, pp. 323-369.

Compeau, D., Higgins, C.A. and Huff, S. (1999), "Social cognitive theory and individual reactions to computing technology: a longitudinal study", *MIS Quarterly*, Vol. 23 No. 2, pp. 145-158.

Connolly, T. and Zeelenberg, M. (2002), "Regret in decision making. Current directions", *Psychological Science*, Vol. 11 No. 6, pp. 212-216.

Dasborough, M.T. (2006), "Cognitive asymmetry in employee emotional reactions to leadership behaviors", *The Leadership Quarterly*, Vol. 17 No. 2, pp. 163-178.

Davis, F. (1993), "User acceptance of information technology: system characteristics, user perceptions and behavioral impacts", *International Journal of Man-Machine Studies*, Vol. 38 No. 3, pp. 475-487.

Davis, F., Bagozzi, R.P. and Warshaw, P.R. (1989), "User acceptance of computer technology: a comparison of two theoretical models", *Management Science*, Vol. 35 No. 8, pp. 982-1003.

Davis, F.D. (1989), "Perceived usefulness, perceived ease of use, and user acceptance of information technology", *MIS Quarterly*, Vol. 13 No. 3, pp. 319-340.

Deci, E.L. (1975), *Intrinsic Motivation*, Plenum Press, New York, NY.

Elster, J. (1998), "Emotions and economic theory", *Journal of Economic Literature, American Economic Association*, Vol. 36 No. 1, pp. 47-74.

Erlikh, L. (2000), "Leveraging legacy system dollars for e-business", *IT Professional*, Vol. 2 No. 3, pp. 17-23.

Fagan, M.H., Neil, S. and Wooldridge, B.R. (2008), "Exploring the behavioral intention to use computers: an empirical investigation of the role of intrinsic motivation, extrinsic motivation, and perceived usefulness", *Journal of Computer Information Systems*, Vol. 48 No. 3, pp. 31-38.

Fazio, R.H. and Zanna, M.P. (1981), "Direct experience and attitude-behavior consistency", in Berkowitz, L. (Ed.), *Advances in Experimental Social Psychology (6)*, Academic Press, New York, NY, pp. 161-202.

Fishbein, M. and Ajzen, I. (1975), *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*, Addison-Wesley, Reading, MA.

Forgas, J.P. (2003), "Affective influences on attitudes and judgments", in Davidson, R.J., Scherer, K.R. and Goldsmith, H. (Eds), *Handbook of Affective Sciences*, Oxford University Press, New York, NY, pp. 596-618.

Forgas, J.P. and George, J.M. (2001), "Affective influences on judgments and behavior in organizations: an information processing perspective", *Organizational Behavior and Human Decision Processes*, Vol. 86 No. 1, pp. 3-34.

Frijda, N.H. (1986), *The Emotions*, Cambridge University Press, New York, NY.

Gefen, D. (2003), "Assessing unidimensionality through Lisrel: an explanation and example", *Communications of the Association for Information Systems*, Vol. 12 No. 2, pp. 23-47.

George, J.M. (1990), "Personality, affect, and behavior in groups", *Journal of Applied Psychology*, Vol. 75 No. 2, pp. 107-116.

Gratch, J. and Marsella, S. (2004), "A domain-independent framework for modeling emotion", *Cognitive Systems Research*, Vol. 5 No. 4, pp. 269-306.

Gregor, S., Lin, A., Gedeon, T., Riaz, A. and Zhu, D. (2014), "Neuroscience and a nomological network for the understanding and assessment of emotions in information systems research", *Journal of Management Information Systems*, Vol. 30 No. 4, pp. 13-48.

Helson, H. (1964), *Adaptation-Level Theory*, Harper and Row, New York, NY.

Hewstone, M. (1989), *Causal Attribution: From Cognitive Processes to Cognitive Beliefs*, Blackwell, Oxford.

Higgins, E.T. (1997), "Beyond pleasure and pain", *American Psychologist*, Vol. 52 No. 12, pp. 1280-1300.

Hong, S.E., Kim, J.K. and Lee, H.S. (2008), "Antecedents of use-continuance in information systems: toward an integrative view", *Journal of Computer Information Systems*, Vol. 48 No. 3, pp. 61-73.

Huy, Q.N. (2002), "Emotional balancing of organizational continuity and radical change: the contribution of middle managers", *Administrative Science Quarterly*, Vol. 47 No. 1, pp. 31-69.

Izard, C.E. (1977), *Human Emotions*, Plenum Press, New York, NY.

Jasperson, J., Carter, P.E. and Zmud, R.W. (2005), "A comprehensive conceptualization of post-adoptive behaviors associated with information technology enabled work systems", *MIS Quarterly*, Vol. 29 No. 3, pp. 525-557.

Karahanna, E., Straub, D.W. and Chervany, N.L. (1999), "Information technology adoption across time: a cross-sectional comparison of pre-adoption and post-adoption beliefs", *MIS Quarterly*, Vol. 23 No. 2, pp. 183-213.

Kelly, J.R. and Barsade, S. (2001), "Emotions in small groups and work teams", *Organizational Behavior and Human Decision Processes*, Vol. 86 No. 1, pp. 99-130.

Kemper, T.D. (1978), *A Social Interactional Theory of Emotion*, Wiley, New York, NY.

Kim, H.W., Chan, H.C. and Chan, Y.P. (2007), "A balanced thinking-feeling model of information systems continuance", *International Journal of Human-Computer Studies*, Vol. 65, pp. 511-525.

Lawler, E.J., Thye, S.R. and Yoon, J. (2000), "Emotion and group cohesion in productive exchange", *American Journal of Sociology*, Vol. 106 No. 3, pp. 616-657.

Lazarus, R.S. (1991), *Emotion and Adaptation*, Oxford University Press, New York, NY.

Lazarus, R.S. (1999), *Stress and Emotion: A New Synthesis*, Springer, New York, NY.

Lazarus, R.S. and Folkman, S. (1984), *Stress, Appraisal, and Coping*, Springer Publishing Company, New York, NY.

Liao, C., Chen, J.-L. and Yen, D.C. (2007), "Theory of planning behavior (TPB) and customer satisfaction in the continued use of e-service: an integrated model", *Computers in Human Behavior*, Vol. 23 No. 6, pp. 2804-2822.

Lindgaard, G. and Dudek, C. (2003), "What is this evasive beast we call user satisfaction?", *Interacting with Computers*, Vol. 15 No. 3, pp. 429-452.

Lindquist, K.A., Siegel, E.H., Quigley, K.S. and Barrett, L.F. (2013), "The hundred-year emotion war: are emotions natural kinds or psychological constructions? comment on lench, flores, and bench (2011)", *Psychological Bulletin*, Vol. 139 No. 1, pp. 255-263.

Lin, K.M., Chen, N.S. and Fang, K.T. (2011), "Understanding e-learning continuance intention: a negative critical incidents perspective", *Behaviour and Information Technology*, Vol. 30 No. 1, pp. 77-89.

Loiacono, E. and Djamasbi, S. (2010), "Moods and their relevance to systems usage models within organizations: an extended framework", *AIS Transactions on Human-Computer Interaction*, Vol. 2 No. 2, pp. 55-72.

McGrath, K. (2006), "Affection not affliction: the role of emotions in information systems and organizational change", *Information and Organization*, Vol. 16 No. 4, pp. 277-303.

Martin, R.A., Kuiper, N.A., Olinger, L.J. and Dance, K.A. (1993), "Humor, coping with stress, self-concept, and psychological well-being", *Humor: International Journal of Humor Research*, Vol. 6 No. 1, pp. 89-104.

Northcraft, G.B. and Neale, M.A. (1987), "Experts, amateurs, and real estate: an anchoring-and-adjustment perspective on property pricing decisions", *Organizational Behavior and Human Decision Processes*, Vol. 39 No. 1, pp. 84-97.

Ortiz de Guinea, A. and Webster, J. (2013), "An investigation of information systems use patterns: technological events as triggers, the effect of time, and consequences for performance", *Mis Quarterly*, Vol. 37 No. 4, pp. 1165-1188.

Ortiz de Guinea, A.O. and Markus, M.L. (2009), "Rethinking the roles of intention, habit, and emotion", *MIS Quarterly*, Vol. 33 No. 3, pp. 433-444.

Ortiz de Guinea, A.O., Titah, R. and Léger, P. (2014), "Explicit and implicit antecedents of users' behavioral beliefs in information systems: a neuropsychological investigation", *Journal of Management Information Systems*, Vol. 31 No. 4, pp. 309-340.

Parkinson, B. (1995), *Ideas and Realities of Emotion*, Routledge, London.

Parkinson, B. (1997), "Untangling the appraisal – emotion connection", *Personality and Social Psychology Review*, Vol. 1, pp. 62-79.

Pieters, R. and Zeelenberg, M. (2005), "On bad decisions and deciding badly: when intention behavior inconsistency is regrettable", *Organizational Behavior and Human Decision Processes*, Vol. 97 No. 1, pp. 18-30.

Roberts, P. and Henderson, R. (2000), "Information technology acceptance in a sample of government employees: a test ofthe technology acceptance model", *Interacting with Computers*, Vol. 12 No. 5, pp. 427-443.

Roca, J.C., Chiu, C.-M. and Martínez, F.J. (2006), "Understanding e-learning continuance intention: an extension of the technology acceptance model", *International Journal of Human-Computer Studies*, Vol. 64 No. 8, pp. 683-696.

Roseman, I.J., Spindle, M.S. and Jose, P.E. (1990), "Appraisals of emotion-eliciting events. Testing a theory of discrete emotions", *Journal of Personality and Social Psychology*, Vol. 59 No. 5, pp. 899-915.

Roseman, I.J., Wiest, C. and Swartz, T.S. (1994), "Phenomenology, behaviors, and goals differentiate discrete emotions", *Journal of Personality and Social Psychology*, Vol. 67 No. 2, pp. 206-221.

Salanova, M., Llorens, S. and Schaufeli, W.B. (2011), "Yes, I can, I feel good & I just do it! On gain cycles and spirals of efficacy beliefs, affect, and engagement", *Applied Psychology: An International Review*, Vol. 60 No. 2, pp. 255-285.

Schelling, T. (1984), *Choice and Consequence: Perspectives of an Errant Economist*, Harvard University Press, Cambridge, MA.

Sheppard, B.H., Hartwick, J. and Warshaw, P.R. (1988), "The theory of reasoned action: a meta-analysis of past research with recommendations for modifications and future research", *Journal of Consumer Research*, Vol. 15 No. 3, pp. 325-343.

Shih, H.P. (2004), "Extended technology acceptance model of internet utilization behavior", *Information and Management*, Vol. 41 No. 6, pp. 719-729.

Taylor, S. and Todd, P.A. (1995), "Understanding information technology usage: a test of competing models", *Informaton Systems Research*, Vol. 6 No. 2, pp. 144-176.

Thüring, M. and Mahlke, S. (2007), "Usability, aesthetics and emotions in human-technology interaction", *International Journal of Psychology*, Vol. 42 No. 4, pp. 253-264.

Venkatesh, V. (1999), "Creation of favorable user perceptions: exploring the role of intrinsic motivation", *MIS Quarterly*, Vol. 23 No. 2, pp. 239-260.

Venkatesh, V. (2000), "Determinants of perceived ease of use: integrating control, intrinsic motivation, and emotion into the technology acceptance model", *Information Systems Research*, Vol. 11 No. 4, pp. 342-365.

Venkatesh, V. and Davis, F.D. (1996), "A model of the antecedents of perceived ease of use: development and test", *Decision Sciences*, Vol. 27 No. 3, pp. 451-481.

Venkatesh, V. and Davis, F.D. (2000), "A theoretical extension of the technology acceptance model: four longitudinal field studies", *Management Science*, Vol. 46 No. 2, pp. 186-204.

Verkanplen, B. and Orbell, S. (2003), "Reflections on past behavior: a self-reported index of habit strength", *Journal of Applied Social Psychology*, Vol. 33 No. 6, pp. 1313-1330.

Weiner, B. (1986), *An Attributional Theory of Motivation and Emotion*, Springer-Verlag, New York, NY.

Weiss, H.M. and Cropanzano, R. (1996), "Affective events theory: a theoretical discussion of the structure, causes and consequences of affective experiences at work", *Research in Organizational Behavior*, Vol. 18, pp. 1-74.

Wen, C., Prybutok, V.R. and Xu, C.Y. (2011), "An integrated model for customer online repurchase intention", *Journal of Computer Information Systems*, Vol. 52 No. 1, pp. 14-23.

Zhang, P. (2013), "The affective response model: a theoretical framework of affective concepts and their relationships in the ICT context", *MIS Quarterly*, Vol. 37 No. 1, pp. 247-274.

Zhang, P. and Sun, H. (2009), "The complexity of different types of attitude in initial and continued ICT use", *Journal of American Society for Information Science and Technology*, Vol. 60 No. 10, pp. 2048-2060.

Appendix

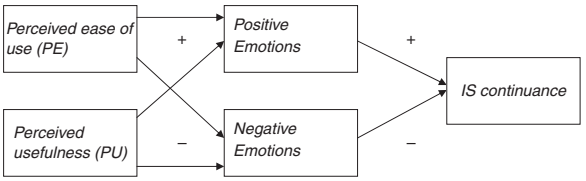

Figure A1. Integrative model adapting both cognition and emotions leading to IS continuance

Corresponding author
Dr Inju Yang can be contacted at: iyang@edcparis.edu