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Conceptualizing Emotion in Information Systems Development

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Abstract

The purpose of this theory paper is to develop a contextual theory of appraisal that may be drawn on to understand emotional processes in IS development (ISD). In short, emotion matters to ISD because managers/professionals lack capacity in dealing with emotionality whether positively or negatively, and there are very few ISD studies that directly focus on emotion. We develop a theoretical lens by inductively examining the substance and intellectual heritage of four emotion theory streams: feeling-centered (e.g. stimulus-response), traditional cognitivist, contemporary cognitivist and socio-cultural. Our model particularly draws on process appraisal theory and extends it with derivative concepts of structuration theory. The resulting contextualized appraisal theory (CAT) constitutes our main contribution to the ISD field.

Keywords: emotion, information systems development, appraisal theory, structuration theory, theoretical lens

Conceptualizing Emotion in Information Systems Development

Introduction

The purpose of this paper is to develop a contextual theory of appraisal that may be drawn on to understand emotional processes in IS development (ISD). Traditionally, ISD research has particularly focused on engineering and human/social issues. Examples of the engineering issues include work on discrete technical properties of software work, such as software reusability (Johnson, 1988; Banker and Kauffman, 1991), software architecture correctness (Barber and Holt, 2001), algorithms (Morris et al., 1992; Mookerjee and Dos Santos, 1993), methodologies, methods and approaches (e.g. Royce, 1970; Beck and Boehm, 2003). With regards human/social issues, researchers have considered participation and conflict (e.g. Mumford, 1983; Robey and Markus, 1984; Wastell, 1996; Barki and Hartwick, 2001), software development agility (Lee and Xia, 2010), organisation-wide transformations (e.g. Humphrey et al. 1991; Paulk et al., 1994; Nielsen and Norberg, 2001; Fitzgerald, 2006), inter-organizational best practices (Radice et al, 1999), collaboration (e.g. Levina, 2005; Vlaar et al, 2008), creativity (Nandhakumar et al, 2013), Improvisation (e.g. Ciborra, 2002) and issues of process/context (e.g. Curtis et al, 1988; Walsham, 1993). The issues presented are not meant to be exhaustive but indicative. So, why should ISD now concern itself with emotion? What is the justification for this focus?

Justifying an emotion focus

The first rustication (J1) is that emotion has been flagged as a concern in ISD since the early 1970s:

"The theory is that emotional problems within organizations do not simply disappear when they are not faced; rather they tend to obstruct the carrying out of rational plans." (Argyris, 1971:p.B-290)

Second (J2), the above quote indicates that emotional problems cause process obstructions.

Third (J3), J2 implies that emotion is an important antecedent to the conduct of planned software work. Planned ISD work includes the aforementioned engineering aspects such as methods (e.g. Royce, 1970; Beck and Boehm, 2003).

Fourth (J4), following on from J1, managers/ISD professionals lack capacity in dealing with emotionality:

"The strategy being suggested is that the competence of both managers and MIS professionals in dealing with emotionality and strain in interpersonal and intergroup problems must be raised." (Argyris, 1971:pB-290)

This point was reinforced in a study of the London Ambulance Service:

"frameworks or models for information systems development and management should address emotional as well as cognitive aspects, and also the interrelationship between these two dimensions. In this way, they need to attend to the moods in which actors approach the task of systems development." (McGrath, 2002:p.20)

Fifth (J5), when J2 is resolved, i.e. emotional moments of misapprehension (Bagozzi, 2003; Vlaar et al, 2008), team relations/bonding benefits follow, yielding an *esprit de corps* (Humphrey et al, 1991:p.21).

Sixth (J6), in the sense of J5, emotions are a motivational resource (e.g. Fredrickson, 2001; Fineman, 2003); emotions are not only responses to occasions but triggers too, impelling us along paths that reflect our priorities (Fineman, 2003:p.103; Lazarus, 1991). There is a great deal of interest in motivation theory in ISD, and more recently in the gamification literature (e.g. Nandhakumar et al, 2013; Deterding et al, 2011).

Seventh (J7), following from J5, when emotions impel the enactment of rational plans, the reasoned action involved is still suffused with emotion. Feelings arise more rapidly than conscious thought, unwittingly informing our cognitive reasoning processes (Argyris, 1971; Kunda, 1990). This is upheld by: (i) the Theory of Motivated Reasoning (Kunda, 1990), (ii) cognitive emotion theorists: emotions signal, sensitise relevant experiences that are drawn on in action (Fineman, 2003; Scherer, 1987), and, (iii) product design literature: "Affect therefore regulates how we solve problems and perform tasks." (Norman, 2002:p39) Emotion therefore applies to a range of ISD process studies.

Eighth (J8), when rational ISD plans break down, more improvised, extemporaneous approaches are apposite in order to manage an emerging situation (Orlikowski 1996; Ciborra 1999; Ciborra, 2002). There are still questions over how improvisation 'works' despite a great many studies that take knowledge and context into account (Berliner, 1994; Weick, 1998).

Ciborra (2002) asserts that understanding emotion is the key here. From this we can say that emotion is an integral aspect of both planned and situated, extemporaneous kinds of action, not solely confined to being an antecedent, but as an ongoing resource (Fredrickson, 2001) that is drawn on to inform the process.

Ninth (J9), there is only a small scattering of ISD studies that directly focus on emotion (e.g. Nelson, 2005; Wang and Ahmed, 2002, McGrath, 2002); it is a topic and concept that requires more focus *per se*.

Furthermore (J10), there is increasing concern with sociomateriality in ISD with calls for more sociomaterial lenses (Orlikowski and Scott, 2007:p.437). The theoretical lens we develop in this paper could address this need.

These ten justifications, demonstrate the relevance of emotion to ISD as well as potential contributions. Generally, the ISD field needs a comprehensive theorization of emotion. A general aim of this paper is to address this theoretical deficiency. We now explicate our particular aims.

Aims of the Paper

The main aim of this paper is to develop a Type II theory (Gregor, 2006) – a theoretical lens of emotion for ISD phenomena, such as those aforementioned in the justifications and human/social ISD research themes. This theory type is appropriate since emotion is still imperfectly understood (Gregor, 2006:p.625). We inductively examined (e.g. Van de Ven and Poole, 1995) the substance and intellectual heritage of various emotion theories, which can be

grouped into four basic streams: feeling-centered (e.g. stimulus-response), traditional cognitivist, contemporary cognitivist and socio-cultural. We draw on process appraisal theory (e.g. Scherer, 1987) and extend it with derivative concepts from structuration theory (Giddens, 1984). The resulting Contextualized Appraisal Theory (CAT) constitutes our main contribution to the ISD field. Follow-on contributions include an understanding of (i) what emotion shapes: e.g. the evaluation of ISD phenomena, leading to actions and adaptations that shape and steer the course of an ISD project (Fineman, 2003; Scherer, 1987), (ii) what emotion is shaped by, e.g. the interpretive conditions of ISD - the interpretative schemes or assumptive stocks of knowledge (Schutz, 1967; Gouldner, 1971; Giddens, 1984; Walsham, 1993) involved such as assumed understandings of software development methodologies and tools, project experiences, associated emotional experiences and taken-for-granted learning, adaptations, on-going sensemaking processes that relate emotional stimuli to interpretative schemes and outcomes.

Before proceeding with an overview of our CAT model, we begin by briefly distinguishing emotion from associated concepts of mood and dispositional affect.

Distinguishing Emotion

Referring to Figure 1, emotions are shorter in duration, more focused and intense (Frijda, 1994; Moors, 2009; Callahan and McCollum, 2002; Scherer 1987). Emotion involves the greatest sensitivity and reaction to discrete events and stimuli. We could say that emotion is more 'spiky' – it comes and goes quickly, relative to other affect types, although its consequences may endure (Bartel and Saavedra, 2000). In contrast, mood involves less sensitivity to stimuli (cf. Ekman, 1984), but it can still greatly affect individual and groups by

creeping up and way on him/her. As a result, it is more enduring than emotion and may exist before and after a particular event or stimulus. Finally, dispositional affect - an individual's general affective attitude to the world (Lazarus, 1991) - is even less sensitive to events than mood or emotions; it is more of a background condition for mood and emotion. Drawing attention to these distinctions illustrates the importance and difference of emotion from mood and affect; it is more potent, and has a greater potential for upheaval and dramatic effects on ISD processes, both positive and negative.

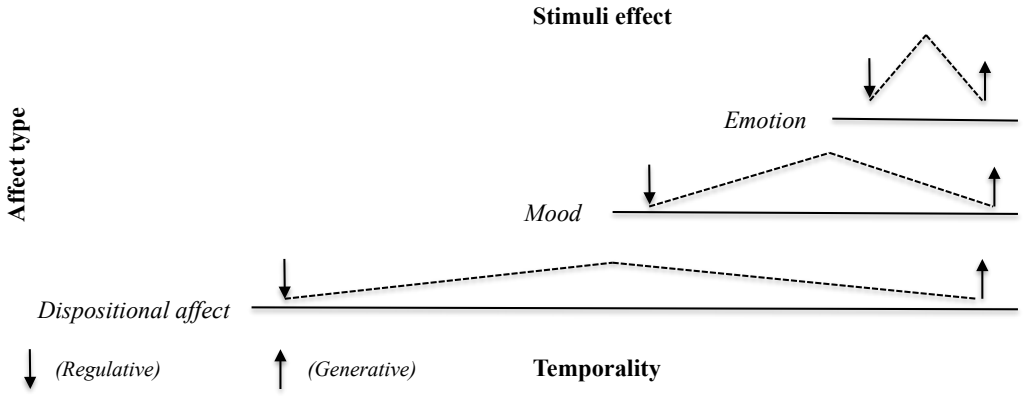

Figure 1: Affect Types versus Temporality

The rest of the paper is structured as follows: (i) we justify our adoption of appraisal process theory perspective, (ii) we present an overview of our *contextual appraisal theory*, which extends appraisal process theory, (iii) we proceed to discuss each of the theory's components and sub-components in detail, (iii) we extend the appraisal sub-components with derivative concepts of structuration theory, specifically the theory of interpretative schemes and reflexive monitoring, (iv) we then proceed synthesize the detailed points of the model and in doing so attend to issues of philosophical compatibility, before drawing the manuscript to a close with some conclusions.

Justifying an Appraisal Process Theory Perspective

This paper fundamentally adopts an appraisal process theory perspective. Our reasoning for adopting this is three-fold. Firstly, appraisal theory is regarded as overcoming the shortcomings of the more 'primal' theories of emotion (Roseman and Smith, 2001) including stimulus-response theories (Watson, 1919), neuro-physiological processes (Descartes, 1649; Cannon, 1927; James, 1894), display theories (Tomkins, 1962**;** Ekman, 1973) and motivation theories in the realms of basic needs such as child hunger (Tomkins, 1962) and intimidation (Parkinson, 1997). Secondly, the above theories lack the capacity to explain certain phenomena including inconsistent responses to stimuli, the situation of the emotional experience (even appraisal theory itself does not entirely and at all times), the irrational aspects of emotions such as being complimented but not being able to accept it, and emotion's developmental facet – some take time to develop, i.e. we are not born with them, but are learned through engagement with normative processes. Thirdly, ISD work is infused with interpretative processes (e.g. Pentland, 1992; Walsham, 1993; Wastell, 1996). There is therefore a ready compatibility of focus and concern between an established tradition in ISD and the appraisal theory we develop further in this paper.

Specifically, we build-on the process model of appraisal (Scherer, 2001). There is also a structural model (Lazarus, 1991) that focuses on the 'what' of appraisal – it breaks down emotions into relational, motivational and cognitive aspects (Lazarus, 1991). However these aspects are all captured in the more recent process models, which are also considered more dynamic because they acknowledge the cyclical processes and sub-processes of appraisal (Smith and Lazarus, 1990).

Contextual Appraisal Theory

It is widely agreed that emotion involves three high-level interactive components (e.g. Scherer 1982; Mesquita and Fridja 1992; Scherer, 2005; Niedenthal et al. 2005; Moors 2009). Referring to Figure 2, these are Stimulus, Appraisal and Consequence. We proceed to explain each high-level component according to componential appraisal theory (e.g. Arnold, 1960; Scherer, 2005; Lazarus, 1991; Parkinson et al, 2005; Moors, 2009).

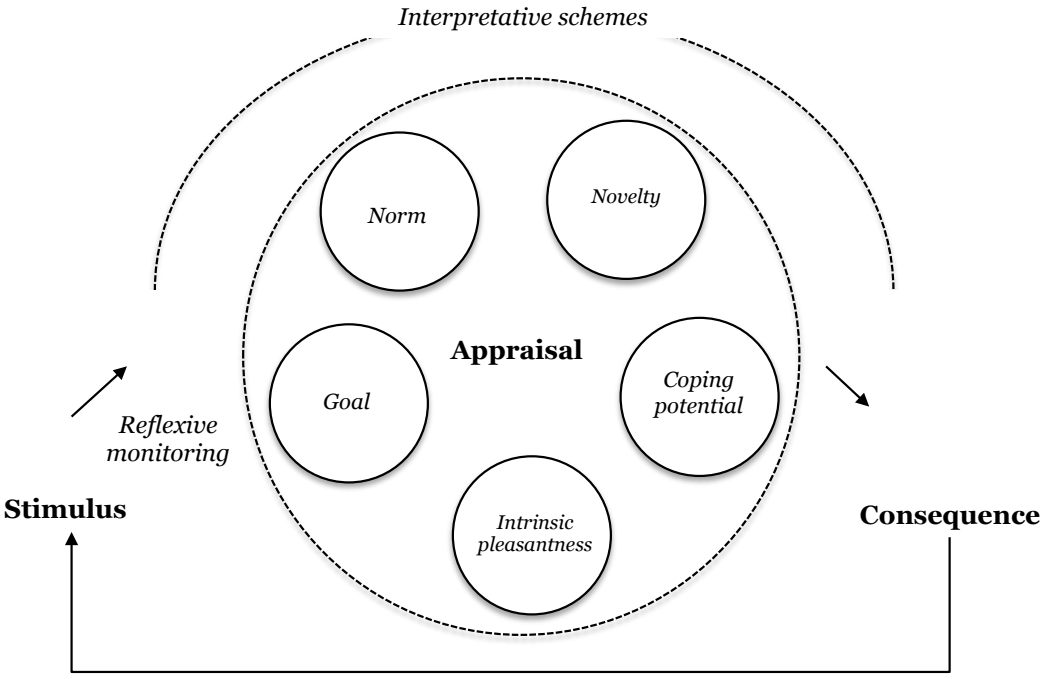

Figure 2: Contextual Appraisal Theory (CAT)

Firstly, a Stimulus can be artifactual, social, physiological, or even a mixture of all three (Descartes, 1649; Hume, 1739; Scherer et al 1986; Callahan and McCollum 2002; Moors 2009). There are a vast number of such stimuli that are reported in the ISD literature. For the purposes of pure example, these could refer to technological objects (Orlikowski, 1993; Bushnell, 1996; Faulkner and Runde, 2013), socio-technical phenomena such as feature creep

(Nelson, 2007), cost overruns (Kiel, 1995), and milestones (Wixom and Watson, 2001), or even heart attacks that impact the ISD process (Stacey and Nandhakumar, 2006).

Secondly, are the Appraisals that people make in respect of the Stimuli. The Appraisal component theorizes that emotions do not depend on the specific characteristics of Stimuli, but rather on the way people interpret and evaluate what is happening to them (Arnold, 1960; Scherer, 2005; Lazarus, 1991; Parkinson et al, 2005:p.6; Moors, 2009). Appraising, interpreting is fairly self-explanatory, but we would like to point out that there is a long tradition of interpretive research in ISD that focuses on the interpretations of ISD participants. For example, Walsham (1993) examined the meanings that organizational actors attached to the design, development and implementation of one stimuli – an information system (IS) at a processing company. The author describes a poignant interpretation of the IS project by a Works Manager, revealing the lack of shared understanding between commercial and production subcultures about the significance of an IS project: "I don't think our managing director fully understood the concept and what is involved – as a result none of us (the senior management team) really threw our weight behind it." (Walsham, 1993:p84). The Appraisal component is theorized to comprise a number of appraisal variables (Moors, 2009:p.630) or sub-components: novelty, norm, intrinsic pleasantness, goal and coping potential (Scherer, 1987; Moors, 2009:p.630). In Figure 2 these are displayed as bubbles circling around "Appraisals". These can be used to unpack interpretations such as the Walsham example in order to help understand and address the emotional dynamics at play in an episode. We discuss these in detail later in the manuscript. Associated with these sub-components are interpretative schemes and aspects of human agency, discussion of which we defer for now.

Suffice it to say that these two theories allow us to unpack and understand the sub-components further, which we believe is a particularly novel feature of our work.

The Third high-level component pertains to the various intended and unintended Consequences of the Appraisal in terms of any emotion produced and action taken (e.g. Lazarus, 1968, 1991; Scherer 1987, 2005; Moors 2009; Callahan and McCollum 2002; Parkinson, et al 2005). An unintended consequence of an interpretive emotion could be action that reproduces and/or transforms the social structures present in an ISD project (Giddens, 1984; Walsham, 1993; Faulkner and Runde, 2013), such as reinforcing a certain managerial approach, for example. The consequences of the appraisal feeds back into the emotion cycle producing stimuli that triggers the 'emotional chain reaction' again. Indeed this process is recognized as recursive and ongoing (Scherer, 1987).

Having presented the three high-level components of the contextual appraisal theory, we proceed with a detailed theoretical analysis of them. This unpacking is what would be expected of any Type II theory (Gregor, 2006). For instance, structuration theory (Jones and Karsten, 1999) – a widely used theoretical lens in ISD – has the three main dimensions Signification, Domination, and Legitimation (Giddens, 1984), which in turn have a number of derivative concepts, such as stocks of knowledge (Walsham, 1993), temporal-spatial ordering of social practices (Sahay, 1997) and constraint (Nandhakumar and Jones 1997).

The Stimulus Component

What is a stimulus? Why 'stimulus'? The emotion literature uses this word very deliberately and consistently. It is defined in the OED as a physiological term, meaning something that

acts as a ‘goad’ or ‘spur’ to a languid bodily organ; an agency that stimulates organic activity, where organic means ‘of the body’.

Firstly, this is ontologically very telling and insightful *per se*. Since early modern philosophy emotion scholarship has adopted a functionalist ontology, the hallmarks of which appear in terms such as ‘stimulus’. From Descartes (1649) to Scherer (1987) emotion theorists have looked to human biology as the science that can provide the most compatible model. For instance, in Descartes’ (1649) study of emotion, he presents a neuro-biological account:

“Finally, it is known that all these movements of the muscles, as well as all the senses, depends on nerves, which are like little filaments or little tubes which all come from the brain and which contain just as it does, a certain very fine air or wind, called the animal spirits.” (p.22)

Indeed, “filaments” and “animal spirits” dominate his ideas on emotion. This neuro-anatomical focus was influenced by Hippocratic medical theory, which posited that human emotions were governed by four bodily fluids or ‘humours’ - melancholy (from Greek for *black bile*), phlegmatic (after *phlegm*), sanguine for *blood* and choleric (anger, from the Greek for *yellow bile*). From this biological, functionalist stance, an emotional stimulus is both material and objective, being of the body and the outside world (Descartes, 1649). This is echoed by Hume (1739) who speaks of these ‘inner’ and ‘outer’ objects as *impressions of sensations*,

"…impressions of sensation are such as without any antecedent perception arise in the soul, from the constitution of the body, from the animal spirits, or from the application of objects to the external organs." (p.275-276)

Secondly, early functionalism assumes that emotion enters us, is sprung upon us by 'animal spirits' and other external non-human emanations. It is as though we were being 'infected' by emotional stimuli. Because these came from elsewhere, the human being was not to be held accountable for them; emotions were imposed, determined. This is consistent with Lockian thought, which explained emotions and their emanations in Creationist terms, reinforcing a distanciation between emotional stimuli and the human being. The character of the stimuli were associated, even connoted with particular pleasure-pain emotions:

"It has therefore pleased our wise Creator to annex to several objects, and the ideas which we receive from them, as also to several of our thoughts, a concomitant pleasure, and that in several objects, to several degrees, that those faculties which he had endowed us with might not remain wholly idle and unemployed by us." (Locke, 1695:p.98)

Thirdly, the implication is that the human body is by default emotion-less, hence 'languid', requiring emotional stimulation. Without organic bodily activity no emotion is deemed to have occurred. But not all human bodily activity is emotional – there are a great many that occur, even without our knowledge, and produce no discernible emotion. What *qualifies* as an *emotional* stimuli therefore requires clarification. We proceed with this.

Qualifying Emotional Stimuli

While acknowledging that Cartesian material stimuli were primary, Hume (1739) suggested there were secondary *reflective impressions* also. He hypothesized that these were responsible for the actual manifestation of specific emotions:

"Secondary, or reflective impressions are such as proceed from some of these original ones, either immediately or by the interposition of its idea… Of the first kind are all the impressions of the senses, and all bodily pains and pleasures: Of the second are the passions, and other emotions resembling them." (Book II, part I, sect. I).

Hume (1739) presents us with a refined understanding then of what may qualify as an emotional stimuli. It is one that results in a secondary reflective impression; until this happens it is only pleasure or pain. Hume (1739) is perhaps the seed of the Cognitive Turn in emotion in the early 20th Century, which moved away from the functionalistic Feeling-centred view towards prioritizations of the mental, reflective, subjective, and phenomenological character of emotion. In traditional cognitivism (e.g. Broad, 1925; Stout, 1929; Price, 1953) emotion is mentally directed at an outer-objective stimulus. The objective stimulus is subjected to the intellectual functions of understanding and judgment, instead of vague reflections or impressions (Deigh, 1994 on Hume, 1739):

"Emotions then are classified within this theory as cognitions, since the theory conceives of them as mental states in which the subject is cognizant of some object." (Deigh, 1994:p.828).

According to Deigh (1994), the kinds of emotions of cognizance include anger, fear, envy, shame, pity, and so forth (p.831) but exclude the 'primitive' emotions or impressions of sensation (Hume, 1739). Although sunbathing involves the pleasure of a natural object – the sun – there is little or no cognitive, intellectual operation applied to it. By contrast, anger involves a person intellectualizing a feeling about someone, because they feel 'violated' by them in some way.

From a traditional cognitivist stance then, an emotional stimuli is more than one that results in just reflections or impressions of phenomena. Rather it is one that stimulates a cognizance in the subject of the objective stimulus and the intellectual cognitions that are performed on the object. An emotional stimulus can only be such if it can elicit the intellectual attention of the subject. To understand this awareness process further we may draw on the concept of reflexive monitoring (Giddens, 1984). Reflexive monitoring involves subjects in the monitoring of their actions in relation to their social contexts (Giddens 1984). It is a means of sensitizing and adapting themselves to situations by taking notice of or selectively ignoring phenomena in accordance with their goals (Lazarus, 1991). It is a key concept in structuration theory that accounts for how and why actors reproduce routine aspects of life as well as transforming them through knowledgeable agentic interventions; it is the main anchoring feature of social integration (Giddens, 1984: p.191).

From this we can further refine our qualification of an emotional stimulus - not only should it result in a cognizance and an intellectual operation on it, but it has implications for the subject in terms of their reflexive monitoring (an aspect of cognizance). Not only must it provoke a cognition then, but it is only cognitively processed because it relates to a goal (Lazarus, 1991)

of the subject, which is an essential ‘check’ in the reflexive monitoring of social processes. For example, an emotional stimulus in an ISD project can only be such if there is an implication for a goal, whether of a personal or collective nature, such as a deadline. A missed deadline is an emotional event (Soderlund, 2005). For an emotional stimulus to be ‘noticed’ and cognitively processed, ‘something must happen’ to the goals set in the normative course of ISD work. A pre-condition of an emotional stimulus then is that goals have been set either personally or collectively and that a course of action in respect of those goals is already underway. By establishing goals and processes the seeds are then set for emotional stimuli. These could relate to all manner of ISD phenomena including milestones, lines of code, development cycles and so forth.

In contemporary cognitivism (e.g. Schacter et al, 1962) it is possible to abstract emotion from any material, objective stimulus; it can be ‘complete thought’ (Deigh, 1994). The subject generates and experiences an emotion through pure thought or meditation without reference to any intro/extrospective object. This contemporary cognitive view suggests an agentic aspect to emotion - the individual can enter a generative as opposed to a responsive mode of emoting. This is perhaps the area that normative ISD project work is least amenable to, in terms of establishing emotional stimuli through goals and so forth. This subjectivist interpretation means that individuals’ generative emotion can itself be a stimulus in a situation; an affective form of agency that can shape ISD work. This disagrees with the Feeling-centered view of emotion, which implies that the human body is by default emotion-less, ‘languid’, until stimulated.

Summarizing this discussion of the Stimulus component, emotional stimuli can be objective, inter-subjective and subjective in nature. Early modern philosophy regarded these as objective, whereas traditional and contemporary cognitivism accept them as inter-subjective and subjective, respectively. With some closure, we can say that in order for a stimulus to qualify as emotional, a phenomenon must stimulate a cognizance and an intellectual operation on it, and have implications for the subject's reflexive monitoring. The phenomenon is only cognitively processed and so recognized as an emotional stimulus because it relates to a goal of the subject. This is an apt juncture at which to shift our discussion to the 'next' component – Appraisal – which expands our understanding of the cognitive processing that takes place with respect to a stimulus.

The Appraisal Component

An appraisal is defined by the OED as the action or an act of estimating or assessing the quality or worth of something or someone. We can see the qualities of assessment and worth in the above discussion of what qualifies as an emotional stimuli – e.g. does something matter in relation to personal or collective goals and 'projects' (Lazarus, 1991; Giddens, 1993). This is one aspect of the process by which people interpret and evaluate what is happening to them as per Appraisal theory (Arnold, 1960; Scherer, 2005; Lazarus, 1991; Parkinson et al, 2005:p.6; Moors, 2009). According to the theory, appraisal involves five sub-components or appraisal variables (Scherer, 2005; Moors, 2009). These sub-components are: novelty, intrinsic pleasantness, goal/need significance, coping potential and norm/self compatibility. While emotion theorists largely agree on these five, they disagree on whether they occur in strict a order (Moors 2009; Scherer, 1987). We take a teleological perspective on this point – i.e. that purpose or goal (the production of an emotion) is the final cause for guiding

movement of an emotional entity (Van de Ven and Poole, 1995:p.515-516). In this sense the order of movement through the sub-components is not fixed or prescribed; it does not matter. What does matter is that there is a purpose or goal. In our discussion of Stimulus, we established the premiss that in order for an emotional stimulus to be recognized as such, a goal must have been identified. Therefore a teleological assumption is justifiable on this point, hence the non-sequential presentation of the sub-components in the CAT model (Figure 2). We proceed to discuss each sub-component in no particular order, even though we numerically itemize them below.

- The 'first' sub-component involves an evaluation of the *novelty* of the stimulus. Various questions are considered: Is it a familiar event? Does it occur frequently? (Zajonc, 1980). Is it predictable or not? (e.g. Miller, 1981; Mineka & Henderson, 1985). Can the stimulus be ignored? If the answer to these questions is 'no' then a process of orienting, focusing and alerting occurs (Averill, 1975; Plutchik, 1980), or, if yes, then homeostasis and some level of certainty about the nature of the stimuli occurs (Scherer, 1987). This orienting, focusing and alerting tends to be associated with 'pain', whereas the homeostasis is something more comfortable or pleasurable. However, while these questions are helpful in understanding the sub-component, they are somewhat misleading as the reality may not involve so precise an evaluation. The assessment of novelty depends on the individual's reflexive monitoring, which contributes to their awareness of their own and their peers' experience and knowledge.

- Secondly, this novelty assessment manifests itself in a cognitivistic sense of *intrinsic pleasantness*, i.e. the mental pleasure and/or pain associated with a stimulus. Various possibilities occur here - novelty may induce a pleasant surprise, while a familiar unwelcome

stimulus could induce frustration if, for instance, learning has not occurred since the last encounter that could resolve the challenge posed. Indeed, a variety of feelings are possible – the ones we mention are merely indicative and this sub-component remains highly subjective (e.g., Block, 1995; Nagel, 1974).

- A 'third' sub-component is *goal/need significance* – i.e. what is the significance and relevance of the stimulus to the actor's goals? Does the event really matter in light of them? Transaction appraisal theorists argue that those stimuli appraised as relevant to a *central* goal are particularly emotional (Lazarus, 1991; Moors, 2007; Scherer, 2005). As per our discussion on qualifying emotional stimuli, reflexive monitoring also plays a key role here. It is an activity that is already at work when a stimulus comes into view. Given that it overlaps the Stimulus qualification and the more deliberate appraisal process, one may perhaps prioritize this activity, hence we interpose *reflexive monitoring* between Stimulus and Appraisal in Figure 2.

- A 'fourth' sub-component is *coping potential*, i.e. what capability does the actor possess to be able to cope with the Stimulus and its consequences? This involves *b*elief (lowercase b), knowledge and agency (Scherer, 1987), i.e. what the subject *believes* about a stimulus and what capability they have to be able to control it. For example, an encounter with a snake or a new ISD tool in the outside world can invoke an intuitive fear response. However, agentic (re)evaluation may then over-ride initial intuitive belief (e.g. Greenspan, 1988; Moors, 2009). By employing knowledge acquired through education the agent realizes that the type of snake encountered is only a grass snake, and not dangerous. The nature of the object and its significance to the agent will therefore determine what knowledge is appropriate and can support the evaluative aspect of emotion (Solomon, 1976:pp.185-87; Nussbaum, 1990:p.

292). This challenges in some ways the appraisal theory that emotion does not rely on the character of the stimulus; knowledge is an aspect of the subject's coping potential, helping regulate the emotion, which does depend on the type of stimulus. For instance, resentment is a moral-based emotion – it relies on exposure to moral education and socialization (Deigh, 1994:p.839), to knowledge of norms of ethical conduct. Therefore, the subject's exposure to social/institutional structures plays a role too in their capability to cope. As Argyris (1971) predicted:

"As their interpersonal competence in these [emotional] areas increases they will naturally turn to education and structural changes…Under these conditions the participants would also tend to develop a responsibility of continually monitoring their solutions to correct the failures. In short, the team members may need to be helped to modify their behavior" (B-290)

- And finally, the *norm/self-compatibility* sub-component involves a consultation with the situated norms of responses to stimuli (e.g. Scherer, 1986). For example, "is my discursive and gesticular reaction compatible with others?" "Am I over-reacting?" The gesticular side involves a monitoring of the display rules of emotion (Ekman, 1973).

The cultural psychology literature (Mesquita and Fridja, 1982; Good and Kleinman, 1984; Kleinman and Good, 1985; Lutz and White, 1986; Shweder and Haidt, 2000) focuses on and develops the character and role of such socially constructed rules or schemes of meaning (Scherer, 1987). What has not occurred to date is an integration of such an approach into componential appraisal theory. Appraisal/interpretation does not happen in a vacuum (Parkinson, 2001:p.173; Manstead and Fischer, 2001:p.221); interpretivist researchers attest

to its context (e.g. Malinowski, 1954; Geertz, 1973; Kling and Scacchi, 1982; Curtis et al., 1988; Walsham, 1993; Nandhakumar and Avison, 1999; Orlikowski and Iacono, 2001). To conceptualize the interpretive/appraisal context we draw on the theory of 'interpretative schemes' (Ranson et al 1980; Bartunek 1984; Giddens 1984; Shweder and Haidt, 2000).

Interpretative Schemes

During interpretative occasions people draw on 'interpretative schemes' to help them make sense of that occasion (Giddens, 1984; 1993; Bartunek, 1984). For example, when a hand is extended in a greeting it is mutually understood that a handshake should normally follow. If one is asked to play tennis during office hours it will be mutually understandable if the offer is declined because work comes first (Giddens, 1993:p.105). If as two acquainted people walk towards each other and their eyes do not meet, then they do not need to say "hello". Or, when a client and a design practice enter into a contract, it is mutually understood, for now, that payment will made using a currency other than 'Bitcoins'. These examples of the mutual comprehension of meaning involves unspoken interpretative assumptions in routine settings – i.e. that we should shake hands as a formal greeting, and that work takes precedence over play within normal office hours. These instances involve people drawing upon mutual knowledge that is taken-for-granted (Giddens, 1993:p.105), operating in the background as an 'interpretative resource' to be drawn upon to make sense of socioemotional encounters. However, it may be necessary that the scheme is openly expressed in order to substantiate or assert particular interpretations, such as rules. This may involve reference to physical, material and social aspects of context, i.e. emotional stimuli, such as an ISD contract or tool. The appropriation of physical resources in social discourse is a fundamental aspect of

agreement, and cannot be severed from a backdrop of largely implicit, mutual knowledge - the former is interpreted in light of the latter (Giddens, 1993:p.105).

This appropriation requires agency, i.e. an individual's power, knowledgeability and capability to take (meaningful) action, such as the maintenance or even disruption of human relations through reflexive monitoring (Giddens, 1993:p.97). In summary (see Figure 3), interpretative schemes comprise mutual knowledge that is largely unspoken, taken-for-granted, assumptive (Gouldner, 1971) and involves the agentic appropriation of physical aspects of context. A note on how this 'knowledge' is acquired – it is not 'endowed' but 'learned' through exposure to and participation in a wide variety of normative processes and situations such as education, training, and upbringing.

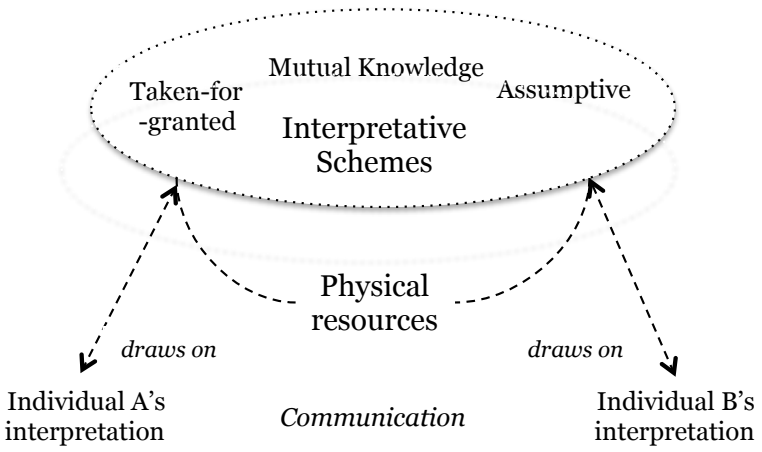

Figure 3: interpretative schemes in social interaction

Implications for Appraisal Sub-components

Some implications follow from the above discussion. We can say that if an interpretative scheme is identified that is relevant to the appraisal of the stimulus then it is likely that this will help guide the emotional contour of an encounter. Conversely, if an interpretative scheme

cannot be identified as relevant to the appraisal of the stimulus then there exists a lack of emotional guidance and a 'first principles' search will ensue (Averill, 1975; Plutchik, 1980) in an effort to overcome the 'knowledge' gap. In order to identify an appropriate interpretative scheme the character of the stimulus in its context needs to be considered. Clearly some interpretative schemes will not be appropriate – e.g. a taken-for-granted knowledge of snakes is not going to be useful in emotionally comprehending a major unexpected 'bug' in a software module. Having said that, the appropriation of meaning requires agency, and analog interpretative schemes may be 'consulted' that offer unique insights into the situation. Some interpretive creativity is therefore a possibility in the invocation of interpretive schemes while 'processing' an emotional experience.

Specific Implications for Appraisal Sub-components:

- *Novelty*: if an interpretative scheme cannot be identified as relevant to the appraisal of the stimulus, then the stimulus will be appraised as novel and unfamiliar, leading to a process of alerting and searching (Averill, 1975; Plutchik, 1980). Conversely, an identifiable interpretative scheme gives an initial orientation and focus to the emotional experience.

- *Goal/need significance*: We have established that through reflexive monitoring people evaluate whether the stimulus really matters, i.e. in reference to their own goals. However, interpretative schemes may nuance the situation by bringing goals of a higher order into focus. For instance, say a developer initially makes light of a design flaw because they do not conceive it to be a priority. The team manager in the shared social context may think otherwise however on account of their understanding of the wider implications. The developer may anticipate this having worked consistently with the manager for some time and therefore

produce a more emotional response than initially anticipated – a 'whoops' moment if you will, informed and 'rescued' through heedful inter-relating (Weick and Roberts, 1993). Interpretative schemes can help re-orient the appraisal then, in accordance with normative, situational rules.

- *Coping potential:* From the points made regarding novelty and goal, the agentic means by which interpretative schemes are drawn upon informs how stimuli are (re)evaluated, thereby over-riding or modifying initial beliefs (e.g. Greenspan, 1988; Moors, 2009). This interpretive agency is enabled by exposure to learning situations, along with the capability to internalize and recall the 'message' of each. We may consider the engagement with and manipulation of interpretative schemes as part of a subject's coping potential or affective agency. Consider a day-to-day example – although an encounter with the dentist's chair usually evokes anxiety, the patient employs the implicit knowledge that the health-check activity should be undertaken on the grounds of health; it rationalizes the encounter. This 'struggles' with other interpretative schemes that the patient may draw on based on accounts told and re-told regarding displeasurable dentist visits; it is taken-for-granted that these are relatively intimidating experiences. Therefore there is not necessarily one all-conclusive interpretative scheme per appraisal; an assemblage of them may be appropriate. It is up to the individuals to trade-them-off, rationalize, combine, and generally employ them in their social encounters in accordance with their agentic capability (Giddens, 1993).

- *Norm/self-compatibility:* it follows that by engaging with and understanding a variety of interpretative schemes that apply to a variety of situations, apposite display rules of emotion will be (re)produced (Ekman, 1973), but in accordance with the reflexive monitoring of the

situation. Put another way, displays of emotion while informed by interpretative schemes and the situational norms, they will be commensurate with the personal intentions realized during reflexive monitoring.

The above are refinements we have made to current understandings of four sub-components in componential appraisal theory. We proceed now to discuss the third high-level component - Consequence.

The Consequences Component

Out of the appraisal process emerge appraisal consequences. A decision is taken over how to emote and act (Lazarus, 1968, 1991; Scherer, 1987, 2001, 2005; Moors, 2009; Clore & Centerbar, 2004; Callahan and McCollum, 2002; Parkinson et al, 2005) – does one smile when criticized by a manager, for example? This could be a strategy to keep oneself motivated in immediately rectifying the problem, aided by drawing on team-level interpretative schemes that inform us that the manager is notoriously pedantic. Interpretative schemes afford us some perspective in this idiographic example, which inform both the appraisal and the consequence. This socio-cognitive response is distinguished from physiological reflexes such as knee-jerks, which have no cognitive content (Leventhal & Scherer, 1987). Appraisal consequences may be an effort to bring work back into rhythm – an emotion-led homeostasis. The consequences then produce new stimuli, which depending on their qualities, may introduce new emotional 'chain reactions'. While some people 'edit' their emotion responses in order to minimize the possibility of generating new disruptive stimuli according to their understanding of ethical conduct (Giddens, 1984), others may exert their agency and not care about the repercussions, preferring to live on the edge with the

consequences (Highsmith, 2002). Consequences in terms of emotions produced may reflect and reproduce or even change existing organizational arrangements such as snubbing a management structure (Walsham, 1993:p84). Consequences are multi-level – emotions are not only mental but are socially displayed too (Ekman, 1973), which are actions themselves.

Having discussed the CAT model in some detail, we now reiterate our intended contributions, before proceeding to discuss and affirm its philosophical validity.

Contributions and Implications

Our first contribution is that we have developed and discussed our contextual model of appraisal theory (CAT) – in our view the ISD field needs such a comprehensive theorization of emotion in order to further the study and understanding of it. It is a Type II theory, which is appropriate since emotion is still imperfectly understood in the field (Gregor, 2006:p.625). It is also meant to be teleological in nature (Van de Ven and Poole, 1995:p.515-516) – the emotional outcomes matter more than the sequence in which the (sub)components occur (Moors, 2009).

Secondly, CAT provides a means for structuring the collection and analysis of data in emotion studies. Similar approaches have been observed in emotion studies such as Smith and Ellsworth (1995).

Some implications of the CAT model follow:

The first possible implication is that IS developers' agency plays a large role in responding to, regulating and generating emotion. This agency, or *affective agency*, involves:

(1) Clarifying multi-level goals so developers know what to care about.

(2) Reflexive monitoring in consonance with ISD goals.

(3) Reflexive monitoring should be managed to involve exposure to/engagement with a variety of interpretative schemes that relate to a goal, thereby developing a portfolio of schemes to orient the ISD professional.

(4) Points 2 and 3 lead to learning

(5) As per Argyris (1971), learning enhances the professional's potential to cope with emotionality

(6) The capability to select, adapt and synthesize interpretative schemes depending on the novelty of a stimulus.

(7) The capability to actively evaluate stimuli in terms of the sub-components: goals, novelty, coping potential, norms, intrinsic pleasantness.

These abstracted implications can be anchored into contemporary issues in ISD such as cost-time overruns (e.g. Kiel, 1999), control and release (e.g. Humphrey et al. 1991), agile versus waterfall (e.g. Beck and Boehm, 2003), system analyst-user communication (e.g. Newman and Noble, 1990), and so forth. Emotion is an important pin across these issue because it is the mediator across the interpretation of key stimuli/events, and the prudent action and reactions to them. Consilient or differential emotional reactions signal consilient or differential interpretations and the 'chain reactions' that follow. Differential emotional responses could be the result of misaligned goals, lack of awareness i.e. to much silo-ing, interpretative schemes that are in flux and therefore provide no binding force in a team. Of course, emotions are displayed differently according to culture and backgrounds (Ekman, 1973) but there are 'pressure points' that managers/professionals can monitor and therefore anticipate and detect emotional responses. Managers should consider the novelty of ISD stimuli, the ability of individuals under their responsibility to cope, the norms of the group and multi-level goals - of individuals, sub-groups and groups, the degree of engagement (reflexive monitoring) of professionals, which is observable to some degree via actions and language use (interpretative schemes). This is only possible if managers really engage with their staff in the first place.

Firstly, an issue in cost-time overruns is the inability of groups to correctly anticipate and monitor whether and how system projects are progressing. The interpretive frames, supported by particular tools and techniques (e.g. SW-CMM, sprints, milestones) often supersedes the setting and regulating of action towards goals. Emotion is a valuable informating and adaptation mechanism in this respect (Fineman, 2003; Scherer, 1987). By unravelling, tapping into and understanding team members' emotions, managers can uncover serious issues in a

project, and thereby setup adaptive strategies to deal with the situation. According to CAT, emotional responses to stimuli can be unpacked and understood in terms of multi-level goals, novelty of the stimuli, coping potential of the team, reflexive monitoring of participants or their 'engagement' to put it more crudely, the interpretative schemes that are invoked through the responses, as well as the alignment between these contextual appraisal variables (Figure 2). The 'true' impact or consequences of stimuli can be better understood in this way. Indeed, this analysis of the emotional responses to stimuli may unravel much more than first anticipated, providing useful information to managers. For instance, through this process, related issues such as individuals' knowledge deficiencies may be revealed. Looking at this the other way round, managers could proactively strive for cost/time control by considering potential traps relating to goals, novelty, coping potential, reflexive monitoring and interpretative schemes.

Secondly, in control and release situations two different emotional frames are brought into play – one evaluative and the other generative. The emotional dynamics involved here are two different emotional realities and both can be recognized and invoked at different points-in-time. The generative emotional frame works the other way round, having implications for the contextual appraisal variables as project variables – i.e. the novelty, goal, capabilities, norms, and even language or informational aspects of the project artifacts. The generation of these aspects then folds back into a control mode, which become stimuli in themselves and project participants then have to deal with and manage the consequences of their ideas.

Thirdly, with regards agile *versus* waterfall, these have different stimulus-appraisal-emotion settings. The former responds to project outcomes without setting broad project goals;

responding to stimuli through a generative approach. The latter manages the unexpected by planning for the expected and then monitoring reactions to stimuli through control.

Fourthly, there are implications for systems analyst - user communication. Different emotional dynamics occur depending on the role of the analyst, either as facilitator or expert (Hirschheim and Klein, 1989). As a facilitator the analyst plays a more negotiative, neutral role; this role could be enhanced by the analyst paying attention to CAT appraisal variables – they can be used in facilitating a solution and brokering agreement. As an expert there is much more potential for emotional disruption, whether negative or positive, depending on how this is carried out. Again, cogniscence of the CAT appraisal variables could enable the expert to conduct the work more sensitively and therefore successfully.

Secondly, there are implications for structuration theory. Giddens has been criticized for his lack of attention to the inner-life of the agent (Bailyn, 2002; Callahan, 2004). Archer (2000) goes further to point out that this is a symptomatic of sociology in general. Our CAT model shows that derivative concepts of structuration such as reflexive monitoring and interpretative schemes can be integrated with processual appraisal theory – thereby creating a bridge between the socio/agentic and emotional realms. Further, our model implies that social structures can shape emotion. It follows then that ISD organizations need to be attentive to the emotional 'chain reactions' that structural properties can invoke. Using our model to 'design' positive (Fineman, 2003) 'emotional chain reactions' could potentially enhance the creative capacities of organizations (e.g. Amabile et al, 2005; Conradi and Fuggetta 2002; Gallivan, 2003); no determinism in this 'design' is assumed however.

Having discussed some principal contributions and implications, we now turn to the philosophical validity of the CAT model.

Philosophical Validity of CAT

From the above discussion, our CAT model exhibits a mixture of functionalist and interpretative paradigms (Burrell and Morgan, 1979).

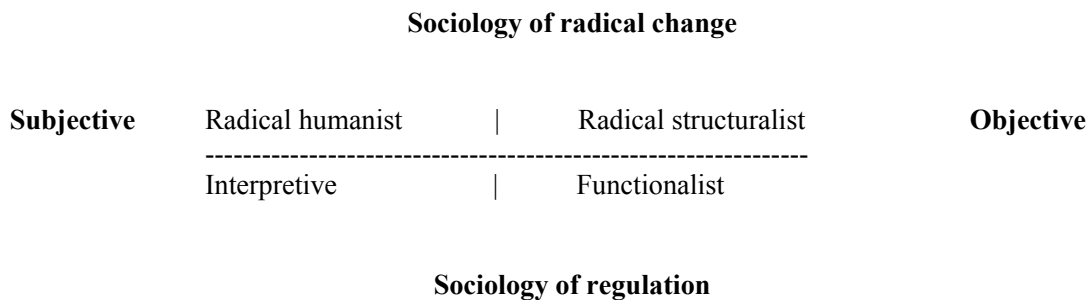

Figure 4: Reproduced from Burrell and Morgan (1979)

Functionalism is well established in emotion theory (Descartes, 1649; Locke, 1695; Hume, 1739; Scherer, 1987) and ISD (e.g. Checkland, 1981), whereas the socio-cultural, interpretive aspects have only come into focus in emotion research more recently (Mesquita and Fridja, 1982; Good and Kleinman, 1984; Kleinman and Good, 1985; Lutz and White, 1986; Shweder and Haidt, 2000). Drawing on Figure 2, functionalism has been employed in understanding the following specific features of emotion:

- Emotional stimuli (Descartes, 1649; Locke, 1695; Hume, 1739; James, 1884; Scherer, 1987, 2005)
- Feeling-centered responses to stimuli (intrinsic pleasantness) (Descartes, 1649; Locke, 1695; Hume, 1739; James, 1884)

- Componential appraisal processes and sub-components (Scherer, 1987, 2005; Niedenthal et al. 2005; Moors 2009).

While interpretative sociology has been employed in understanding:

- Interpretative schemes – the socio-cultural, ethnic contexts of emotion - (Mesquita and Fridja, 1982; Good and Kleinman, 1984; Kleinman and Good, 1985; Lutz and White, 1986; Shweder and Haidt, 2000)
- Human agency (Giddens, 1993)

We proceed to clarify in what way we can regard these concepts as paradigmatically compatible, thereby addressing the philosophical validity of the model.

Firstly, we would like to point out that extending a functionalistic process appraisal model (e.g. Scherer, 1987) with derivative concepts of structuration theory is not an paradigmatic violation. Consider how Giddens (1993) relates functionalistic systems to structuration theory:

"Social systems involve relations of interdependence between individuals or groups, that typically can be best analyzed as recurrent social practices. Social systems are systems of social interaction; as they involve the situated activities of human subjects and exist syntagmatically in the flow of time…To study the structuration of a social system is to study the ways in which that system, via the application of generative rules and resources and in the context of unintended outcomes, is produced and reproduced in interaction " (p.118-119)

Firstly, and in furtherance, this implies that the functionalistic, systems side of emotion is pertinent during recurrent social practices or routine aspects of day-to-day life. Componential appraisal models assume an ongoing, patterned interaction between the components in order to produce an emotional whole. This renders emotion as seemingly stable and predictable under routine conditions, and structuration indeed takes account of this in its theorizing of the reproduction of social structures and systems. The kinds of emotions that are salient here are those that consistently emerge in a context, that exhibit a routine nature: upon recurrent encounters with a stimulus, repeat appraisals and consequences; certain emotions may become systemic. Consider some indicative though not representative examples from the ISD literature concerning the sustained or routine aspects of ISD work:

Firstly, the values of Scandinavian ISD techniques are based on community values (Floyd et al., 1989:p263). An emotion linked to this idea is interpersonal emotional connectedness (warmth and closeness) (Scholz et al, 2005:p.136) It could be argued then that Scandinavian ISD approaches involve 'routine' emotions of connectedness.

Secondly, the situated appropriation of routine development cycles in Soft Systems Methodology (Checkland, 1981:p.276), the iterative aspects of agile methods (Kruchten 1996; Beck, 1999) or the Waterfall model (Royce, 1970). Routine emotions that express comfort (Fineman, 2003) or ontological security (Giddens, 1993) are possible, as well as constant frustrations with routine tick-off type work:

"The root of the [emotional] problem often lies with long-standing and deeply embedded ground rules or habits that govern the group. We call those rules norms" (Goleman et al., 2002:p223).

Thirdly, consider the sustained conflict that is possible between the variety of disciplines that comprise ISD teams (Barki and Hartwick, 2001; Levina, 2005; Brown et al, 2008). These are examples of how emotional 'chain reactions' could become routine, exhibiting systemic properties, but subject to the agency of those involved:

"the seed of change is there in every act which contributes towards the reproduction of any 'ordered' form of social life" (Giddens, 1993:p108).

This agency also signals that the hand of functionalism is inconsistent with the kinds of emotion that flare-up extemporaneously, whether generative or provoked, or positive or negative. For instance, play exhibits a fleeting nature which is an escape from routine (Huizinga, 1970:p.26). Play radiates spontaneity (Zain and Rickards, 1996), and being on the verge of being beyond control (Sroufe and Waters, 1976). Play evokes emotion, "a free and voluntary activity, a source of joy and amusement" (Huizinga, 1970:p26), and joy is "a sense of pleasure plus the urge toward exuberance and contact-seeking" (Frijda, 1988:p351). These kinds of nonroutine, extemporaneous emotions have an unpredictable nature that are more agentic, (inter)subjective, and non-systemic; they evolve outside of any social patterning (Giddens, 1993). Improvisation has similarities to that of play in its being situated and emergent (Ciborra, 2002) occurring at the meeting point of thought and action, at a moment in time (Orlikowski, 1996; Ciborra, 1999; Stacey and Nandhakumar, 2009). At the same time, it

has an ordered, interpretivist shade in the sense that improvising actors are able to bring order from the clutches of disorder; "chaordic" action (Highsmith, 2002). Take the following example regarding developing a Graphical User Interface (GUI) which although not intended by the following authors to be demonstrative of improvisation, there is a sense of it, "if you are developing a graphic user interface (GUI) for an unprecedented decision support system and want to document its requirements, the most frequent answer you will get from users is, "I can't tell you in advance, but I'll know it when I see it (IKIWISI). In such a case, it is a high risk to try to document the GUI in advance" (Ågerfalk and Fitzgerald, 2006:p31). In this quote is the element of sense emerging from uncertainty.

In such complex situations actors may start with alternative and often competing explanations for experiences and events, but insist that "Over time, interpretations become objectified, diffused, and widely internalized into what comes to be called a consensus on what is 'out there'" Weick, 1995:p79). This is particularly noticeable during emergencies where capable individuals and teams improvise life-saving solutions out of chaos (Ciborra 1999). For example, although not life-saving, it was reported how system designers had to 'design in the dark' by trying to second-guess the requirements due to unforeseen lack of access to executive users (Nandhakumar and Jones, 1997). Improvisation depends on and helps transform the situation.

In this way, an improvised process begins with the possibility of nonroutine emoting while tending towards the ordered, more systemic kind as 'things settled down' and sense emerges; hence the more systemic nature of the CAT model comes more into play at this point.

Structuration theory is capable of capturing this mélange of the agentic and the systemic and their inter-relationship. Therefore, we qualify that a structurationist perspective enables the paradigmatic and epistemological compatibility of the concepts presented in the CAT model (Figure 2). We may 'know' emotion both systemically and interpretatively.

Further, while both functionalism and interpretivism assume the pursuit of 'order' or structure (Hirschheim and Klein, 1989:p.1202) (see Figure 4), they differ in terms of ontology however - Burrell and Morgan (1979) classify interpretivism as subjective, and functionalism as objective. Objectivism or materialism regards the world as consisting of matter and that all the things in the world are differentiated solely by different material constitutions (Benton and Craib, 2001: p.183). Subjectivism or idealism regards reality as purely mental or traces in the mind (Giddens, 1993:p.117). Dualism addresses the weaknesses of this binary opposition - idealists are not convincing in their negation of a material independent external reality, nor are materialists with respect to their denial of an inner subjective experience (Benton and Craib, 2001). Social reality is rather viewed as consisting of body and mind. There are a variety of duality theories including the transformational model of social action (Bhaskar, 1978), structuration theory (Giddens, 1984; Barley, 1986; Orlikowski and Baroudi, 1991; Orlikowski and Robey, 1991; Walsham, 1993; Jones and Nandhakumar, 1993; Stacey and Nandhakumar, 2009) and more recently sociomaterialism (Orlikowski, 2007; Orlikowski and Scott, 2008), which builds on the structurationist duality of technology approach (Leonardi, 2013:p.65). Sociomaterialism focuses on the bound-up nature of the social and material:

"Research framed according to the tenets of a sociomaterial approach challenges the deeply taken-for-granted assumption that technology, work, and organizations should be

conceptualized separately, and advances the view that there is an inherent inseparability between the technical and the social." (Orlikowski and Scott, 2008: p.434)

Sociomaterialism emphasizes the mutuality of actors and objects; they are bound-up in a composite assemblage that expresses their inextricable relationship. Sociomaterialism attempts to distance itself from duality theories. There has been discussion of an ontological shift away from structuration theory to agential realism (Barad, 2003:p.816; Leonardi, 2013:p.65; Orlikowski, 2007:p.1438) on account that the former emphasizes independently existing entities (humans and technology) as opposed to constitutive entanglement. In our view, such an ontological shift is unnecessary in the CAT model for two reasons. Firstly, in structuration theory's discussion of interpretative schemes, which plays a key role in the model, the material aspects of social discourse are affirmed as being fundamental to agreement; materiality cannot be severed from interpretative schemes - the former is interpreted in light of the latter (Giddens, 1993:p.105). Secondly, the structurational dimensions (Signification, domination, legitimation) and realms (structure, agency) are only identified by Giddens (1984) for analytical convenience (Orlikowski, 1992:p.408; Walsham 1993:p60; Reijonen, 2000); their bound-up nature was always intended.

We therefore adopt a structurationist ontology in our understanding and articulation of emotion. While the sociomaterial debate focuses on technology objects and people, it does not preclude other forms of materiality such as the body (Orlikowski and Scott, 2008:p.455), which of course is fundamental in terms of the physiology of emotion (Descartes, 1649; James, 1884; Scherer, 1987). As well as the physiological materialities are the technological ones (e.g. Faulkner and Runde, 2013), which are conceptualized in the CAT model as

emotional stimuli, whose recognition and appraisal relies on the reflexive monitoring of the agent and interpretative schemes that they activate. Therefore it makes sense to couch the CAT model as a structurationist sociomaterial theory. We now proceed to further discuss and interpret our model in light of these ontological notes.

While the CAT model identifies three high-level components, appraisal sub-components, involving agentic activities (reflexive monitoring) and structural properties (interpretative schemes), these features are identified for analytical convenience only (Walsham 1993:p60); their inextricable composition (Orlikowski and Scott, 2008) is assumed. The material (physiological, technological) and discursive stimuli, their interpretative processing and consequences, constitute a composite shifting assemblage; they are mutually constitutive of the emotion activity. The material (physiological, technological), social (interpretative schemes) and cognitive (reflexive monitoring, appraisal) dimensions are integral to emotion. The model could be a candidate conceptual lens in the study of emotional sociomateriality in ISD (Orlikowski and Scott, 2008:p.437).

In the following section we present a vignette which we draw upon to provide the empirical material we need to illustrate how the CAT model (Figure 2) can be use as a Type II theory (Gregor, 2006).

Conclusions

In this paper we have justified a focus on emotion and developed a Type II theory (Gregor, 2006) of emotion 'CAT' for ISD phenomena through an inductive reasoning approach (Van de Ven and Poole, 1995). For this contextualized appraisal theory we drew on process

appraisal theory (e.g. Scherer, 1987) and extended it with derivative concepts from structuration theory (Giddens, 1984). Follow-on contributions included an understanding of what emotion shapes and is shaped by. CAT can also be used to structure the collection and analysis of data regarding emotion in ISD. Some implications are that IS developers' agency plays a large part in responding to, regulating and generating emotion, i.e. *affective agency.* Seven implications were given on this note, including the clarification of ISD project goals, as well as the alignment of reflexive monitoring and interpretative schemes with them. These abstracted implications were anchored into contemporary ISD issues including cost-time overruns (e.g. Kiel, 1995), control and release (e.g. Humphrey et al. 1991), agile versus waterfall (e.g. Beck and Boehm, 2003), and system analyst-user communication (e.g. Newman and Noble, 1990).

The paradigmatic validity of the model was also discussed, concluding that a structurationist perspective enables the paradigmatic and epistemological compatibility of the concepts presented in the CAT model (Figure 2).

In rejoinder to the justifications for this study and theorization of emotion at the beginning of the manuscript, have we come far since Argyris (1971). Perhaps we have by a deep engagement with mainstream emotion theories and the development of a theoretical lens to enable future studies. Empirical work is needed to put CAT to work. With regards the process obstructions that emotions can cause (J2), these can possibly be overcome through formulating agreements in ISD teams in terms of multi-level goals, and the sharing of interpretative schemes. With regards (J4), with CAT we can enhance managers' capacity to deal with emotionality through fostering *affective agency* in terms of reflexive monitoring,

goal setting, as well as engagement with various interpretative schemes/resources. With regards (J6) emotions are a motivational resource when they connect with agentic and structural properties such as shared multi-level goals and interpretative schemes.

References

Archer, M. 2000. Being Human: The Problem of Agency, Cambridge, UK: Cambridge University Press.

Amabile, T. M., Barsade, S. G., Mueller, J. S., & Staw, B. M. (2005). Affect and Creativity at Work. Administrative Science Quarterly, 50 (2005): 367–403

Ågerfalk, P. J. and B. Fitzgerald (2006). "Flexible and Distributed Software Processes: Old Petunias in New Bowls?" Communications of the ACM October 2006/Vol 49(49): 27-34.

Argyris, C. (2010). Management Information Systems : The Challenge to Rationality and Emotionality, Management Science, Vol. 17, No. 6, Application Series (Feb., 1971), pp. B275-B292

Arnold, M. B. (1960). Emotion and personality. New York: Columbia University Press.

Averill, J.R. (1975). A semantic atlas of emotional concepts. JSAS Catalog of Selected Documents in Psychology, 5, Ms. No. 421.

Bagozzi, R. P. (2003). Positive and Negative Emotions in Organizations. Positive Organizational Scholarship: foundations of a new discipline. K. S. Cameron, J. E. Dutton and R. E. Quinn. San Francisco, Berrett-Koehler Publishers.

Bailyn, J. (2002). "Who makes the rules? Using Wittgenstein in Social Theory." journal for the Theory of Social Behaviour 32(3).

Banker, R.D., and Kauffman, R. J. (1991). "Reuse and Productivity in Integrated Computer-Aided Software Engineering : An Empirical Study", *MIS Quarterly*, 15(3), 375–401.

Barad, K. (2003). Posthumanist performativity: Toward an understanding of how matter comes to matter. Signs, 28(3), 801–831.

Barber, K. S. and J. Holt (2001). "Software Architecture Correctness." IEEE Software Nov/Dec.

Barki, H. and J. Hartwick (2001). "Interpersonal conflict and its management in information systems development." MIS Quarterly **25**(2): pp. 195-228.

Barley, S. (1986). "Technology as an occasion for structuring: Evidence from observations of CAT scanners and the social order of radiology departments." Administrative Science Quarterly 31: 78-108.

Bartel, C. a., & Saavedra, R. (2000). “The Collective Construction of Work Group Moods.” *Administrative Science Quarterly*, 45(2), 197.

Bartunek, J.M. Changing interpretive schemes and organizational restructuring: The example of a religious order. Administrative Science Quarterly, 1984, 29(3), 355–72.

Beck, K. (1999). Extreme programming explained: embrace change. Boston, MA, Addison-Wesley Longman Publishing Co., Inc.

Beck, K. and B. W. Boehm (2003). "Agility through Discipline: A Debate." IEEE Computer **6**: 44-46.

Benton, T. and I. Craib (2001). "Philosophy of Social Science, The Philosopical Foundations of Social Thought." book.

Berliner, P. F. (1994). Thinking in Jazz: The infinite art of improvising. Chicago, IL, University of Chicago,.

Bhaskar, R. (1978, March). On the possibility of social scientific knowledge and the limits of naturalism. Journal for the Theory of Social Behaviour, 8(1), 1-28.

Block, N. (1995). On a confusion about a function of consciousness. Behavioral and Brain Sciences, 18, 227-287

Broad, C.D. (1925). The Mind and its Place in Nature. New York: Harcourt Brace.

Brown, A. D., Stacey, P., & Nandhakumar, J. (2008). Making sense of sensemaking narratives. Human Relations, 61(8), 1035–1062.

Burrell, G. and G. Morgan (1979). Sociological paradigms and organisational analysis : elements of the sociology of corporate life. Aldershot, Ashgate.

Bushnell, N. (1996). "Relationships between Fun and the Computer Business." Communications of the ACM 39(8).

Callahan, J. L. (2004). "Reversing a conspicuous absence: Mindful inclusion of emotion in structuration theory." Human Relations 57(11): 1427–1448.

Callahan, J.L. and E.E. McCollum, (2002), "Conceptualizations of Emotion Research in Organizational Contexts," Advances in Developing Human Resources, 4(1) 4-21.

Cannon., W.B. (1927) The James-Lange Theory of Emotion: A Critical Examination and an Alternative Theory. American Journal of Psychology, 39, 106-124.

Checkland, P. (1981). Systems Thinking, Systems Practice. Chichester, Wiley.

Ciborra, C. U. (1999). "Notes on improvisation and time in organizations." Accting., Mgmt. & Info. Tech. 9(2): 77–94.

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

Clore, G. L., & Centerbar, D. (2004). Analyzing anger: How to make people mad. *Emotion*, 4, 139-144

Conradi, R. and A. Fuggetta (2002). "Improving software process improvement." IEEE Software 19(4, July/August).

Curtis, B., H. Krasner, et al. (1988). "A Field Study of the Software Design Process for Large Systems." Communications of the ACM **31**(11).

Deigh, J. (2013). Cognitivism in the Theory of Emotions, Ethics, 104(4), 824–854.

Descartes, R. (1649) (1989) The Passions of the Soul. trans. Stephen H. Voss. Indianapolis: Hackett.

Deterding, S., Dixon, D., Khaled R., & Nacke L. (2011), *From game design elements to gamefulness: defining 'Gamification'*, Proceedings of MindTrek, 2011.

Deterding, S., Sicart, M., Nacke, L., O'Hara, K., & Dixon, D. (2011). Gamification. using game-design elements in non-gaming contexts. Proceedings of the 2011 Annual Conference Extended Abstracts on Human Factors in Computing Systems - CHI EA '11, 2425.

Ekman, P. (1984). Expression and the nature of emotion. In K. Scherer & P. Ekman (Eds.), Approaches to emotion (pp. 319–344). Hillsdale, NJ: Lawrence Erlbaum.

Ekman, P. Cross-cultural studies of facial expression. In P. Ekman (Ed.) Darwin and Facial Expression: A Century of Research in Review. New York: Academic Press, 1973, 169-222

Fägerlind, T. Lindroth, M. Magnusson, & C. Östlund (Eds.) Proceedings of the 23rd Information Systems Research Seminar in Scandinavia (IRIS 23): Doing IT together. (Volume I). Lingatan, Sweden, August 12 -15, 2000, 473 – 485

Faulkner, P. and Runde, J. (2013). Technological Objects, Social Positions, and the Transformational Model of Social Activity. MIS Quarterly, Vol. 37 No. 3, pp. 803-818/September 2013

Fineman, S. (2003). Understanding Emotion at Work. London, Sage Publications.

Fitzgerald, B. (2014). "The Transformation of Open Source Software", *MIS Quarterly*, Vol. 30, No. 3 (Sep., 2006), pp. 587-598

Floyd, C., W.-M. Mehl, et al. (1989). "Out of Scandinavia: Alternative Approaches to Software Design and System Development." Human-Computer Interaction 4(4): 253-350.

Frederickson, B. L. (2001) “The role of positive emotions in positive psychology.” American Psychologist, 56: 218–226.

Frijda, N. H. (1988). "The Laws of Emotion." American Psychologist May: 349-358.

Gallivan, M. J. (2003). The influence of software developers’ creative style on their attitudes to and assimilation of a software process innovation. Information & Management, 40(5), 443–465.

Geertz, C. (1973). The interpretation of cultures: selected essays. New York, Basic Books.

Giddens, A. (1984). The Constitution of Society: Outline of the Theory of Structure. Berkeley, CA., University of California Press.

Giddens, A. (1993). The Giddens Reader. (Ed) Cassell, P. London, Macmillan.

Goleman, D., R. Boyatzis, et al. (2002). The New Leaders: Transforming the art of leadership into the science of results, Time Warner.

Good, B.J. and Kleinman, A.M. (1984). Culture and Anxiety: Cross-cultural Evidence for the Patterning of Anxiety Disorders. In A.H. Tuma and J.D. Maser (Eds), Anxiety and the Anxiety Disorders (pp.297-324). Hillsdale, NJ:Erlbaum.

Gouldner, A.W, (1971) The Coming Crisis of Western Sociology. London: Heinemann

Greenspan, P.S. (1988). Emotions and Reasons: An Inquiry into Emotional Justification. London: Routledge

Gregor, S. (2006). “The Nature of Theory in Information Systems”, MIS Quarterly Vol. 30 No. 3, pp. 611-642/September 2006

Highsmith, J. (2002). Agile Software Development Ecosystems. Boston: MA., Addison-Wesley.

Highsmith, J. (2002). Agile Software Development Ecosystems. Boston: MA., Addison-Wesley.

Hume, D. (1739). 1978. A Treatise of Human Nature, ed. Selby Bigge, L.A. Oxford: Clarendon.

Humphrey, W. S. (1988). "Characterizing the software process: a maturity framework." Software, IEEE **5**(2): 73-79.

Humphrey, W. S., T. R. Snyder, et al. (1991). "Software Process Improvement at Hughes-Aircraft." Ieee Software **8**(4): 11-23.

Huizinga, J. (1970). Homo Ludens. London, Granada Publishing Ltd.

James, W. (1894). The Physical Basis of Emotion. Psychological Review, 1, 516-529

Johnson, R.E. and Foote, B., (1988) “Designing Reusable Classes”, *Journal of Object Oriented Programming*, June/July, 1988

Jones, M. E. and J. Nandhakumar (1993). Structured Development? A Structurational Analysis of the Development of an Executive Information System. Human, Organisational and Social Dimensions of Information Systems Development. J. E. K. s. J. I. D. in D. Avison. Amsterdam, North-Holland.

Jones, M. and H. Karsten (2003). "Review: structuration theory and information systems research." Research Papers in Management Studies - Judge Institute of Management, University of Cambridge, WP 11/2003.

Kiel, M. (1995). “Pulling the Plug: Software Project Management and the Problem of Project Escalation.” MIS Quarterly, December: 421-447

Kleinman, A.M. and Good, B.J. (1985). (Eds) Culture and Depression: Studies in the Athropology and Cross – cultural Psychiatry of Affect and Disorder. Berkeley: University of California Press.

Kling, R. and W. Scacchi (1982). "The web of computing: computer technology as social organization." Advances in Computers 21: 1-90.

Kruchten, P. (1996). "A Rational Development Process." Crosstalk 9 (7): 11-16.

Kunda, Z. (1990). “The Case for Motivated Reasoning.” *Psychological Bulletin*, Vol. 108, No. 3, 480-498

Lazarus, R.S. (1968) ‘‘Emotions and Adaptation: Conceptual and Empirical Relations’’, in W.J. Arnold (ed.) Nebraska Symposium on Motivation Vol. 16, pp. 175– 270. Lincoln, NE: University of Nebraska Press.

Lazarus, R. S. (1991). Emotion and Adaptation, Oxford, UK: Oxford University Press.

Lee, G., and Xia, W. (2010). “Toward Agile: An Integrated Analysis of Quantitative and Qualitative Field Data On Software Development Agility”, *MIS Quarterly,* Vol. 34 No. 1, pp. 87-114/March 2010

Leonardi, P. M. (2013). Theoretical foundations for the study of sociomateriality. Information and Organization, 23(2), 59–76.

Levina, N. (2005). Collaborating on Multiparty Information Systems Development Projects: A Collective Reflection-in-Action View. Information Systems Research, 16(2), 109–130.

Locke, J. (1695) 1975. An Essay Concerning Human Understanding. Ed., Nidditch, P.H. Oxford:Clarendon.

Lutz, C., and White, G. (1986). The Anthropology of Emotions. Annual Review of Anthropology, 15, 405-436.

Malinowski, B. (1954). Argonauts of the Western Pacific. London, Routledge & Kegan Paul.

Mcgrath, K. (2002). "The Golden Circle: A Way of Arguing and Acting About Technology in the London Ambulance Service", *European Journal of Information Systems*. 11(4): 251-266

Mesquita, B., Frijda, N.H., (1992) "Cultural variations in emotions: A review." Psychological Bulletin, 112 (2)

Miller, S.M. (1981). Predictability and human stress: Toward a clarification of evidence and theory. In L. Berkowitz (Ed.), Advances in experimental social psychology. Vol 14. New York: Academic Press.

Mineka, S., & Henderson, R.W. (1985). Controllability and predictability in acquired motivation. Annual Review of Psychology, 36, 495-529

Mookerjee, V. S. and D. L. Dos Santos (1993). "Inductive expert system design: maximising system value." Information systems research **4**(2): 111-140.

Moors, A., (2009), "Theories of emotion causation: A review", Cognition & Emotion 23 (4)

Morris, A. H., G. M. Kasper, et al. (1992). "The effects and limitations of automated text condensing on reading comprehension performance." Information systems research **3**(1): 17-35.

Mumford, E. (1983). "Participative systems design: practice and theory." Journal of Occupational Behaviour **4**(1): 47-57.

Nagel, T. (1974). What is it like to be a bat? Philosophical Review, 83, 435-450.

Nandhakumar, J. and D. E. Avison (1999). "The Fiction of Methodological Development, a Field Study of Information Systems." Information Technology and People 12(2).

Nandhakumar, J. and M. Jones (1997). Designing in the Dark: The Changing User-Developer Relationship in IS Development. Proceedings of the Eighteenth International Conference on Information Systems, Atlanta, Georgia, United States.

Nandhakumar, J., Panourgias, N. and Scarbrough, H.. (2013). "From knowing it to 'getting it': Envisioning practices in computer games development", Information Systems Research, 24 (2013): 933-955.

Nelson, K. (2005). "Exploring Emotions during ERP Adoption: A Stakeholder Analysis." Proceedings of the 38th Annual Hawaii International Conference on System Sciences, 2005. HICSS '05.

Newman, M. and F. Noble (1990). "User Involvement as an Interaction Process: A Case Study." Information Systems Research 1(1): pp. 89-113.

Nielsen, P. A. and J. Norberg (2001). "Assessing software processes: low maturity or sensible practice?" Scandinavian Journal of Information Systems **13**: 23-36.

Niedenthal, P. M., Barsalou, L. W., Winkielman, P., Krauth-Gruber, S., & Ric, F. (2005), "Embodiment in attitudes, social perception, and emotion.", Personality and Social Psychology Bulletin. 9(3) 184-211

Norman, D.A. (2002) Emotion and Design. Interactions, 36-42.

Nussbaum, M. (1990). Love's knowledge. Oxford, UK: Oxford University Press.

Orlikowski, W. J. and J. J. Baroudi (1991). "Studying Information Technology in Organizations: Research Approaches and Assumptions." Information Systems Research 2(1): 1-28.

Orlikowski, W. J. and D. Robey (1991). "Information Technology and the Structuring of Organizations." Information Systems Research 2(2): 143-169.

Orlikowski, W. J. (1993). "CASE tools as organisation change: investigating incremental and radical changes in systems development." MIS Quarterly 17(3): 309-340.

Orlikowski, W. J. (1996). "Improvising Organizational Transformation Over Time: A Situated Change Perspective." Information systems research 7(1): 63.

Orlikowski, W. and S. Iacono (2001). "Desperately Seeking the 'IT' in IT Research—A Call to Theorizing the IT Artefact." Information Systems Research 12(2): 121-134.

Orlikowski, W. J., & Scott, S. V. (2008). "Sociomateriality: Challenging the Separation of Technology, Work and Organization." *The Academy of Management Annals*, 2(1), 433–474.

Orlikowski, W.J. (2007). Sociomaterial practices: Exploring technology at work, Organization Studies, 28, 1435–1448.

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

Parkinson, B. (2001). Putting Appraisal in Context. In K. R. Scherer, A. Schorr, & T. Johnstone (Eds.), Appraisal processes in emotion: Theory, methods, research (pp. 3?19). New York: Oxford University Press

Parkinson, B., A.H. Fischer, and A.S.R. Manstead, (2005) Emotions and social relations: Cultural, Group, and Interpersonal Processes. New York: Psychology Press.

Paulk, M., M. Chrissis, et al. (1994). The Capability Maturity Model: Guidelines For Improving The Software Process, Addison Wesley.

Pentland, B. T. (1992). "Organizing moves in Software Support Hot Lines." Administrative Science Quarterly **37**.

Plutchik, R. (1980). Emotion: A psychobioevolutionary synthesis. New York: Harper & Row.

Price, H.H. (1953). Thinking and Experience. Cambridge, Mass.: Harvard University Press

Radice, R. A., J. T. Harding, et al. (1999). A programming process study. IBM Systems Journal, IBM Corporation/IBM Journals. 38: 297.

Ranson, S., B. Hinings, et al. (1980). "The structuring of organizational structures." Administrative Science Quarterly 25: 1-14.

Reijonen P. (2000). Software developmet and IS use. In L. Svensson, U. Snis, C. Sørensen, H.

Robey, D. and M. L. Markus (1984). "Rituals in Information system design." MIS Quarterly **8**(1): pp.5-15.

Roseman, I. J., & Smith, C. A. (2001). Appraisal theory: Overview, assumptions, varieties, controversies. In K. R. Scherer, A. Schorr, & T. Johnstone (Eds.), Appraisal processes in emotion: Theory, methods, research (pp. 3?19). New York: Oxford University Press

Royce, W. W. (1970). "Managing Development of Large Scale Software Systems." IEEE WESCON, TRW: 1-9.

Sahay, S. (1997). “Implementation of Information Technology: A Time–Space Perspective,” Organization Studies (18:2), pp. 229-260.

Schachter, S., & Singer, J. (1962). Cognitive, Social, and Physiological Determinants of Emotional State. Psychological Review, 69, pp. 379–399.

Scherer, K.R. (1982) “Emotion as a Process: Function, Origin, and Regulation”, Social Science Information 21: 555–70.

Scherer, K. R., H. G. Walbott, et al. (1986). Experiencing emotion: A cross-cultural study. Cambridge, Cambridge University Press.

Scherer, K. R. (1987). “Toward a dynamic theory of emotion: The component process model of affective states”. *Geneva Studies in Emotion and Communication*, 1, 1-98.

Scherer, K. R. (2001). Appraisal considered as a process of multilevel sequential checking. In K. R. Scherer, A. Schorr, & T. Johnstone (Eds.), Appraisal processes in emotion (pp. 92?120). New York: Oxford University Press

Scherer, K. R. (2005) What are emotions? And how can they be measured? Social Science Information-Sur Les Sciences Sociales 44: 695–729.

Scholz, M., Maud, R., Scholz, K., Gantchev, K. and Thomke, V. (2005). Multiple family therapy for anorexia nervosa : concepts, experiences and results. Journal of Family Therapy (2005) 27: 132–141

Schutz, A. (1967). Phenomenology of the Social World. Evanston, IL, Northwestern University Press.

Shweder, R. A., & Haidt, J. (2000). The cultural psychology of the emotions: Ancient and new, In M. Lewis & J. Haviland (Ed.), Handbook of emotions 2nd edition, (pp. 397-414). New York: Guilford

Smith, C. A. and Lazarus, R.S. (1990). Emotion and Adaptation. In L.A. Pervin (Ed.). Handbook of Personality: Theory and Research. (pp. 609-637). New York: Guilford.

Soderlund, J. (2005). What project management really is about: alternative perspectives on the role and practice ofproject management, International Journal of Technology Management, Vol. 32, Nos. 3/4.

Solomon, R. C. (1976). The Passions, the Myth and Nature of Human Emotion. Garden City, NY: Doubleday

Sroufe, L. A. and E. Waters (1976). "The ontogenesis of smiling and laughter: A perspective on the organization of development in infancy." Psychological Review 83: 173-189.

Stacey, P. and J. Nandhakumar (2006). Responding to games development challenges through mood-mediated improvisation, Proceedings of the 14th European Conference on Information Systems (ECIS'2006), Göteborg, Sweden, June 2006.

Stout, G.F. (1929). A Manual of Psychology. 4th Ed. London: University Tutorial Press.

Tomkins, S.S. (1962). Affect, Imagery, Consciousness: Vol. 1. The Positive Affects. New York: Springer.

van de Ven., A.H and Poole, M.S. (1995) "Explaining Development and Change in Organizations", *Academy of Management*, Vol. 20, No. 3 (Jul., 1995), pp. 510-540

Vlaar, P.W., van Fenema, P.C., and Tiwari, V., (2008). "Cocreating Understanding and Value in Distributed Work: How Members of Onsite and Offshore Vendor Teams Give, Make, Demand, and Break Sense." *MIS Quarterly,* Vol. 32 No. 2, pp. 227-255/June 2008

Walsham, G. (1993). Interpreting IS in Organisations. Chichester, John Wiley.

Wastell, D. G. (1996). "The fetish of technique: methodology as a social defence." Inform Syst J **6**(1): 25-40.

Watson, J.B. (1919) Psychology from the Standpoint of a Behaviorist. Philadelphia: Lippincott.

Weick, K. (1998). "Introductory Essay: Improvisation as a Mindset for Organizational Analysis." Organization Science 9(5): pp. 543-555.

Weick, K. E., and Roberts, K. H. (1993). Collective mind in organizations: Heedful interrelating on flight decks. Administrative Science Quarterly. 38 357–381.

Wixom, B. H., & Watson, H. J. (2014). An Empirical Investigation of the Factors Affecting Data Warehousing Success, MIS Quarterly, Vol. 25, No. 1 (Mar., 2001), pp. 17-41

Zain, M. and T. Rickards (1996). "Assessing and comparing the innovativeness and creative climate of firms." Scandinavian Journal of Management 12(2): pp.109-121.

Zajonc, R. B. (1980). Feeling and thinking: Preferences need no inferences. American Psychologist, 3, 151?175.