7-1-2013

Emotion Regulation In Management: Harnessing The Potential Of Neurois Tools

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EMOTION REGULATION IN MANAGEMENT: HARNESSING THE POTENTIAL OF NEUROIS TOOLS

Research-in-progress

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Abstract

Management decisions are taken by human beings, not by robots. Consequently, management decisions, and of course also the respective managers, are affected by emotions. Thus, they rely on accurate emotional processing. Research on decision making has shown that individuals with high emotion regulation capabilities perform better in taking effective decisions. Managers perpetually have to take rapid decisions in fast-paced environments, between the poles of diverse interests and motives of colleagues, customers, partners, and rivals. Sophisticated management is the key to any business. Therefore, we argue that IS research should build on the advances in cognitive neuroscience and harness the potential of NeuroIS tools in the field of management support. In this paper, we propose a conceptual framework and taxonomy for how NeuroIS tools may support managers in taking effective decisions by firstly improving their emotion regulation capabilities and, secondly, providing them with real-time feedback and decision support based on physiological measurements. Based on the framework, we outline a specific application for how emotions can affect decision making in the dynamic process of negotiations and for how NeuroIS research can contribute to a better understanding of the underlying visceral processes.

Keywords: Decision Support, Emotion Regulation, Management, NeuroIS, Negotiations, Tools.

1 Introduction

Sophisticated management is the key to any business. The daily activities of managers include staffing, coaching, and motivating teams, organizing, delegating and controlling work, planning and forecasting, negotiating and many more. These activities have a common denominator: They all involve rapid decision making with material consequences which can possibly be long-lasting. "The first managerial skill is, therefore, the making of effective decisions" (Drucker, 1974, p. 374). Effective decision making, however, "depends on prior accurate emotional processing" (Bechara and Damasio, 2005, p. 336). In fact, emotions can play a powerful role in managerial decisions (Malhotra and Bazerman, 2008). Managers can be affected by their current emotional state, experience emotions in response to the outcomes of their decisions, and experience anticipatory emotions with respect to future outcomes (Rick and Loewenstein, 2008). Emotions can be beneficial or detrimental to effective decision making in complex, interpersonal management processes. Shapiro (2004), for example, demonstrated that understanding of own intrapersonal and interpersonal emotions can improve the efficiency and effectiveness of negotiations. Thus, a manager's skill for making effective decisions (partially) depends on his capability to recognize and regulate his or her emotions. In addition, Ferrada and Camarinha-Matos (2012) argued that emotions play a major role for the effectiveness of collaboration.

In this paper, we propose a conceptual framework for how NeuroIS tools can support managers in taking effective decisions. Vom Brocke et al. (forthcoming, p. 17) argued that "IT artifacts with built-in neuroscience tools may even adjust to the affective state of the user." We build on this by further arguing that such NeuroIS tools can expand managers' adaptive toolbox (cf. Gigerenzer and Selten, 2002) by improving their emotion regulation capabilities. Emotion regulation is the conscious and unconscious process of sensing, monitoring, managing, expressing, and reacting to one's own emotions and others' emotions (Gross, 2007). Instead of following a normative approach by dictating specific actions or strategies, it is our goal to extend the managers' conscious and subconscious capabilities by providing them with a set of specific NeuroIS tools.

The remainder of this paper is organized as follows: Section 2 defines the conceptual framework and sketches the interplay of management environment, decision processes, emotion regulation capabilities, and NeuroIS tools. Section 3 exemplifies the framework by applying it to emotion regulation in one key management activity, namely negotiations. Section 4 concludes and outlines a further research agenda which is based on our framework.

2 A NeuroIS Framework for Emotion Regulation in Management

This paper presents a systematic taxonomy for how NeuroIS tools can support managers in effective decision making. The manager is, thus, in the focus of our research and constitutes the center of our NeuroIS framework for emotion regulation in management. The framework is depicted in Figure 1 and is structured into four components. First, management does not happen in quarantine, but in a socio-economic context that constitutes the *Management Environment* (1). As managerial decisions naturally rely on their counterparts' statements and actions, this environment interacts with the *Decision Process* (2). Third, a manager's individual *Emotion Regulation Capabilities* (3) can moderate the mediating effects of emotions on decision making. Finally, *NeuroIS Tools* (4) can help to improve and train these capabilities as well as provide the manager with real-time decision support.

All management decisions are embedded in a socio-economic *Management Environment* which comprises both intra-organizational and external entities. This involves human individuals as for instance, co-workers, colleagues, competitors, customers as well as organizational entities such as other companies, regulation, law, and the general public. In other words, management decisions are not made in isolation, but in the context of other people, companies, and institutions (Drucker, 1974). There is a wide range of interactions of the manager with the environment. The negotiation of

contracts with suppliers is one example; other examples are price competition, buying, selling, auctioning, interviewing, communicating decisions, and many more.

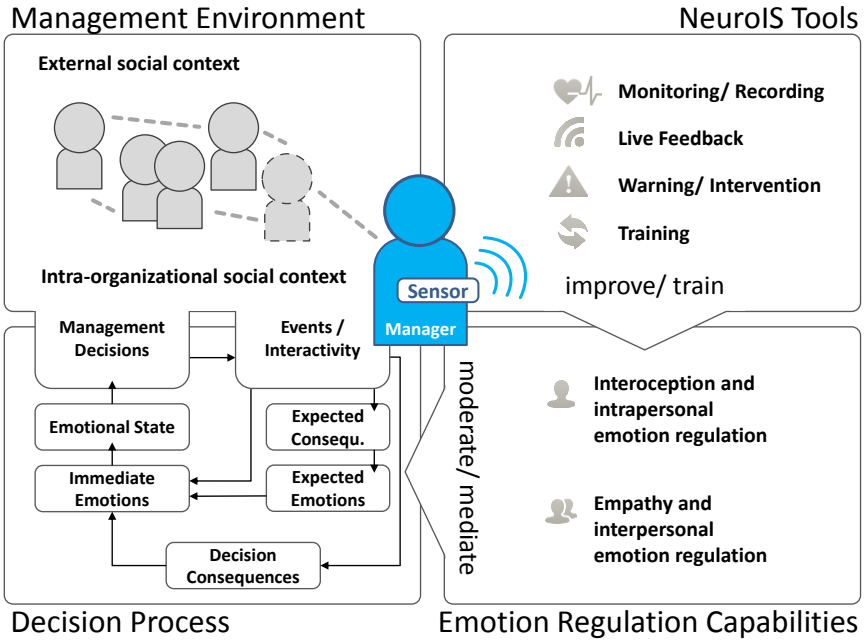

Figure 1. NeuroIS Framework for Emotion Regulation in Management

All management decisions are the result of dynamic *Decision Processes*. These processes involve both cognitive as well as emotional elements. In the framework, we draw a distinction between immediate, expected, and anticipatory emotions (cf. Rick and Loewenstein, 2008; Adam et al. 2011b). An immediate emotion is a direct response to an event, e.g. a burst of anger in response to financial losses (decision consequences). While immediate emotions are directly experienced by the manager, an expected emotion is an expected emotional reaction in response to a future event. An expected emotion is not directly experienced during the decision process but cognitively taken into account when deliberating on the expected consequences of a decision. This, however, can trigger an anticipatory emotion, which is a special class of immediate emotions and, thus, is directly experienced. In this context, Loewenstein et al. (2001, p. 267) stated: "anticipatory emotions are immediate visceral reactions (e.g. fear, anxiety, dread)." The emotional state refers to the overall state of a manager's emotions at any given time and thereby canalizes the influence of the different emotional reactions on management decisions. Both immediate emotions as well as the overall emotional state manifest in physiological changes in the manager and, thus, can be objectively measured with tools from cognitive neuroscience (Dimoka et al., 2012). For instance, immediate emotions comprise activation of the sympathetic nervous systems which in turn results in monophasic peaks in skin conductance (Dawson et al., 2011). With respect to the emotional state, the manager's general level of arousal manifests in his or her overall skin conductance level and heart rate (Adam et al., 2011a). Further parameters include, for instance, pupil diameter, blood pulse, and respiratory rate.

The frequency and intensity of emotions and their impact on decision making are moderated by the manager's *Emotion Regulation Capabilities* (Gross and John, 2003; Gross, 2007). The emotions of an individual "reflect the status of one's ongoing adjustment to constantly changing environmental demands" (Thayer and Lane, 2009, p. 85). There are strong interpersonal differences with respect to how a person consciously and subconsciously regulates emotions. People who, for instance, perform cognitive reappraisal try to cognitively reframe the situation and thereby seek to avoid or intensify specific emotions. Emotion suppression, on the other hand, is a strategy that aims at suppressing emotions that already emerged (Gross and John, 2003). Emotion regulation capabilities also include interoception, i.e. the ability to be aware of one's own emotional state (Wiens, 2005). It is important to highlight though that emotion regulation is not only directed at a manager's own emotions.

Interpersonal emotion regulation, i.e. sharing and handling affective states of other human beings, is also an important capability—particularly for managers. In the daily interaction with other individuals, a manager has to deal with the emotionality of others, e.g., when resolving interpersonal conflict.

In the context of *NeuroIS Tools*, it is important to highlight that a person's emotion regulation capabilities are also reflected in physiological changes. Depending on the respective emotion regulation strategy, effective emotion regulation mitigates, for instance, the intensities of emotions (Sokol-Hessner et al., 2008) and increases heart rate variability (Appelhans and Luecken, 2006). Building on these insights from cognitive neuroscience and the application framework of vom Brocke et al. (forthcoming), we argue that there is a potential for IS design science research to design a set of specific NeuroIS tools that can support managers in taking effective decisions by integrating neuroscience tools into IS artefacts. Thereby, state-of-the-art sensor technology enables IS researchers to conduct continuous physiological measurements in an unobtrusive and unnoticeable way, e.g. by using dry electrodes in chest belts and clothing (Jerčić et al., 2012)—even over several days.

In particular, we identify four specific application fields for NeuroIS tools in management:

1. **Monitoring/ Recording.** By monitoring the emotional state, the manager can reflect on how periods of stress and critical decisions are interlinked with changes in arousal and effective emotion regulation. This is the basis for improvement and can help the manager to better understand the underlying visceral process of decision making.
2. **Live Feedback.** By building on advances in affective computing (Picard, 1997), managers can also receive direct biofeedback on their current emotional states. This may help to increase interoception, re-evaluate decisions, take breaks, speed up or slow down the rhythm of the negotiations process, presentation, or the like. In this context, the electrics company Philips has made an advance by offering a tool to support retail investors whose decisions are impaired by high levels of arousal. The "Rationalizer" is a device that "acts as a kind of emotion mirror in which the user sees reflected the intensity of his feelings in form of dynamic lighting patterns" (Djajadiningrat et al., 2009, p. 39). Similar tools may also help managers in their decision making.
3. **Warning/ Intervention.** Providing live feedback relies on the decision maker's willingness and capability to actually include this feedback into his or her consideration. In the heat of the moment, however, this may often not be possible. There might just not be the time to look at yet another screen or stream of data. Thus, warning and intervention systems provide the manager with urgent feedback and actively avoid decisions with undesired outcomes. Sound notices may warn during states of exceptionally high arousal; sending an email could be automatically delayed by the system if the composer is highly aroused. In this vein, the manager has the opportunity to recall messages that contain overemotional content or tone.
4. **Training.** Biofeedback may also help to improve emotion regulation capabilities over time. More specifically, serious games that integrate biosignals may elicit high levels of arousal and reward effective emotion regulation (Jerčić et al., 2012). In this vein, the manager can actively practice new emotion regulation techniques in an environment without material consequences.

3 Application of the Framework: Emotions in Negotiations

3.1 Practical scenarios

Negotiations as one key management activity serve as example for the application of the framework. Consider, for example, a manager negotiating the salary with a prospective employee, the funding of various projects with a peer, or a service level agreement with a supplier. In these cases, the aforementioned specific application fields of NeuroIS tools apply: *Monitoring and recording* could provide the manager with information on himself, or even on his counterpart's emotional states, in order to be able to reflect the situation. *Live feedback* could signal the current emotional state of the negotiating partners in real-time during the negotiation—they could, for example, use this information to postpone the negotiation or to adjust their strategy depending on the current emotional state. Taking

this one step further, a negotiation support system (Kersten and Lai, 2007) could analyze the data in real-time and provide direct, targeted *warnings and interventions*, e.g., suggesting beneficial offers, particular strategies, or a change of the agenda, depending on the manager's own emotional state or even his counterparties emotional state. Dead ends in the sequence of offers and counteroffers could be detected early on, time-outs could be proposed, or imposed automatically. Eventually, such techniques can be used in *training* managers in becoming better negotiators, e.g. by sensing how their emotional state and common cognitive biases in negotiations affect their negotiation decision making process (Gimpel, 2008). Similar to flight simulation, sparring partners or scripted agents could prepare decision makers for many possible scenarios in negotiations (escalation, state of denial, or deadlock situations) and include biofeedback (arousal, attention, valence, etc.) for live and ex-post evaluation.

3.2 Experiment on monitoring emotions in negotiations

A prerequisite for the above scenario is a rigorous understanding of the role of emotions in negotiations. To this end, we are conducting experiments with physiological measurements and establish these applications one at a time. We start with monitoring/ recording as it is the most basic component. From this, we will derive two insights: Firstly the relevance of emotions for negotiation behavior and outcomes. This adds to the fact base for a negotiation support system to know when and how to intervene. Secondly, we will gain insights into the relative importance of various physiological measurements depending on the scenario and objective. The insights will inform the design of live feedback and training tools that integrate with the manager's environment as seamless as possible.

In the following, we outline the design of an experiment that targets the emergence of emotions in negotiations and their impact on decision making. The experiment is work-in-progress and already comprises physiological measurements of 216 student subjects. The choice of student subjects limits generalizability; however, it provides a relatively homogenous subject pool and reduces heterogeneity that confounds treatment effects (see e.g. Ball and Cech, 1996, for a discussion). Due to its rigor, control, and clear theoretical benchmark, a structured negotiation protocol is implemented. Specifically, we use a two-person, single-issue alternating offer negotiation with perfect information, finite horizon, and shrinking pie size (Rubinstein, 1982). Two participants take turns in making offers on the division of a given amount of money, the pie. The pie size decreases by a discount factor of either 10% or 90% in every round if no division has been agreed upon. This is the first focus variable and reflects the urgency to reach an agreement. Secondly, we consider the two main conditions of negotiation partners: human and computerized. The use of computer agents has two benefits: Methodologically, it helps in (partly) disentangling subjects' social preferences and norms from strategic behavior. Practically, in electronic commerce it becomes increasingly common to interact with computers and, thus, it becomes more and more relevant to understand the specifics of human behavior and emotions when interacting with computer agents (Riedl et al., 2011; Zhang et al., 2012).

Our experiment uses physiological measurements to assess subjects' emotional states (Dimoka et al., 2012). We use heart rate as a proxy for the overall arousal of the participants before they make decisions in the negotiation processes, such as submitting an offer or clicking the "accept" or "reject" button. In this sense, it reflects a subject's very basic emotional state (cp. Figure 1). Heart rate is measured in beats per minute and it is derived from an electrocardiogram recording device. Moreover, we measure the participants' skin conductance throughout the experiment. Sudden changes (within a couple of seconds) of the electrodermal activity are used as a proxy for arousal as reaction to external or internal stimuli. We assess the physiological reaction to specific events (e.g., submitting or receiving an offer, submitting or receiving an answer) using the skin conductance response amplitude (SCR.amp), occurring immediately after the event. The SCR.amp is a proxy for the intensity of immediate emotions (cp. Figure 1) and reflects short bursts of sympathetic nervous system activity (Dawson et al., 2011). One limitation of this approach is that physiological reactions are measured relative to a subject-specific baseline. Thus, the approach is not capable of assessing subjects' long-term psychological condition and sentiment. A second limitation is the choice of parameters: Adding neuroimaging techniques like fMRI, eye-tracking and/or self-report on emotional state would augment

the data. However, it would prohibit or at least lessen the seamless integration in day-to-day management activities. The choice of cardiac and electrodermal activity to assess emotional state is a trade-off between feasibility and profundity. See e.g. Adam et al. (2011a) for a discussion of these parameters. Preliminary results show that emotional responses are stronger when negotiating with humans rather than computer agents and when time pressure (induced by the discount factor) is high.

The first step towards NeuroIS management decision support is an in-depth understanding of the role of emotions and their physiological correlates in management decisions. With the scenario briefly sketched in this section, we intend to investigate the interplay of emotions, the capability to regulate one's emotions, and the actual behavior in negotiation processes. It is the question which individual emotion regulation capabilities and psychophysiological correlates prove to have impact on decisions in the different negotiation situations. Understanding this interaction in a controlled, laboratory setting is a prerequisite for meaningful, more sophisticated applications in practice. By taking the human emotional state into account, this approach yields the potential to improve the negotiation outcome, both from the individual (gain, surplus) as well as the aggregated perspective (efficiency, total welfare). Moreover, by identifying patterns in the subjects' physiology, our research can inform the design of NeuroIS tools that focus on warning and intervention as well as training.

4 Conclusions and Further Research Agenda

In this paper we presented a NeuroIS framework for emotion regulation in management. Management decisions influence the people within and beyond a manager's organization. At that, the outcome of the decision frequently depends on the others' decisions and actions. In this context, a manager's decision process is a combination of conscious and unconscious decision making and the application of heuristics. It is strongly influenced by the manager's expected and immediate emotions. The ability to regulate emotions is a central capability of effective managers. It involves interoception and empathy, intrapersonal and interpersonal emotion regulation. In the framework and the negotiation scenario we showed how NeuroIS tools can support managers in becoming better decision makers. These tools provide monitoring, recording, live feedback, warning, intervention, and training functionalities. They can thereby improve decision making in real-time and can be employed as training tools.

NeuroIS tools have challenges. Today, costs, accessibility, labor-intensive data extraction and analysis, measurement issues, and difficulty in interpreting neurophysiological results are but a few of these challenges (Dimoka et al., 2012). In addition, the artificial setting and limited number of physiological measures are limitations of the suggested experiment.

This paper contributes to IS literature by introducing a systematic taxonomy for NeuroIS tools in management. Physiological information on oneself or even others is a resource for business success, in this regard, which we expect to become increasingly important in IS design science research. The aforementioned challenges will likely lose relevance with future research on NeuroIS tools: The further application of the framework will evaluate its applicability and the value of specific NeuroIS tools. Lab experiments should be complemented by field experiments and observational studies.

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