Chapter 38
Designing an Evaluation Tool to Measure Emotional Goals

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ABSTRACT

Human emotions have been widely researched in many disciplines such as psychology, philosophy, neuroscience and medicine. Their importance cannot be underestimated. Unfortunately, so far in software engineering, requirements engineers focus mostly on gathering functional and quality requirements and rarely consider how stakeholders feel or would like to feel when using a software product. Incorporating the user's emotional goals in software engineering can be very challenging considering that emotions are very complex and subjective. Moreover, when it comes to incorporating user emotions in software engineering, existing methodologies or frameworks provide very little guidance to software professionals. In this paper, the authors present work on evaluating emotional goals in a software engineering context. The authors describe the development of a questionnaire as an evaluation tool and evaluate the questionnaire in the context of a digital photo frame placed in the homes of nine older persons living on their own. Further improvements to the tool are proposed based on the findings from the study.

1. INTRODUCTION

In software engineering, requirements elicitation and modelling, the emphasis is predominantly on capturing functional requirements and quality goals (Haigh, 2010; Pacheco & Garcia, 2012). Interestingly, user emotional expectations, though critical to the acceptance of a solution (Mendoza, Miller, Pedell, & Sterling, 2013), are not fully captured. It has been found that even though many software systems deliver all key functional and quality expectations, post-delivery user feedback highlights gaps (Has-

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senzahl, 2008; Lorence & Park, 2006; Meuter, Bitner, Ostrom, and Brown (2005); Wood & Moreau, 2006). A key finding is that the emotional goals of users are an important determinant of the acceptance of a solution, yet they are not adequately addressed in many projects causing them to fail (Demiris et al., 2004; Pedell, Lopez-Lorca, Miller, & Sterling, 2014; Pedell, Sterling, Keirnan, & Dobson, 2013; Ramos, Berry, & Carvalho, 2005).

Addressing the user's emotional goals in the software development life cycle along with functional and quality goals entails a number of challenges. Emotion is a very complex topic and studies are still ongoing in the field (Cambria, Livingstone, & Hussain, 2012; Colomo-Palacios, Casado-Lumbreras, Soto-Acosta, & Garcia-Crespo, 2011; Kay & Loverock, 2008; Martinez-Miranda & Aldea, 2005). The subjective nature of emotions makes it hard to both capture and measure people's emotions. Different approaches have been used to address these problems at different stages of the software life cycle. For instance, the agent-oriented models (Sterling & Taveter, 2009) used for modeling domain in requirements were extended to include emotional goals (Lopez-Lorca, Miller, Pedell, Sterling, and Kissoon-Curumsing (2014); Miller et al., 2014). Design tools like personas and user journeys have also been used to bridge the gap between the analysis and the design phase (Chamberlain, Sharp, & Maiden, 2006; Haikara, 2007). Although there is some early progress on incorporating the concept of emotion in software solutions (Lathia, 2013; Marks, 2013; Urken, 2013), to the best of our knowledge, there is no structured software methodology or framework that describes how to capture, model and incorporate user emotional goals in software engineering.

A key challenge in any methodology that aims to make emotions a first class citizen is in offering robust measures of emotional goals. Even though psychology proposes several measures of emotions such as self-report, questionnaires, observations, facial and speech recognition, heart rate, blood pressure, skin conductance and ECG among others (Clancy & Noyes, 1976; Gough, 1960; Nelis, Rae, & Liddell, 2011), no formal tool or method exist in software engineering to measure the way stakeholders feel when they use a system, nor are there guidelines to capture the emotional expectations of future users.

In this paper, we propose the design of an evaluation tool to measure emotional goals. We elaborate on the use of the tool during a field study involving the use of a digital photo frame by older adults that live at home independently. The results obtained from the pilot study are discussed along with further improvements made to the tool.

The structure of the paper is as follows. Section 2 presents existing work relevant to our work. In Section 3, we describe our case study with the older adults. Section 4 talks about the different design approaches used to come up with the evaluation tool. Section 5 elaborates on the use of the evaluation tool in a field study and discusses the findings from the study. In Section 6, we present the general approach used to design the tool. We conclude the paper in Section 7.

2. LITERATURE REVIEW

In this section, we provide an overview on a key set of studies centered around the emotions, measure of emotions, and the use of emotions in software engineering.