# Chapter 20
# Adding Emotions to Models in a Viewpoint Modelling Framework From Agent-Oriented Software Engineering: A Case Study With Emergency Alarms

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## ABSTRACT

*In modern software development, considering the viewpoints of stakeholders is an important step in building the right system. Over the past decade, several authors have proposed solutions to capture and model these viewpoints. While these solutions have been successful, emotions of stakeholders have been largely ignored. Considering the emotional needs of stakeholders is important because both the users' perceptions of a product and their use of a product are influenced by emotion as much as cognition. Building on recent work in modelling the emotional goals of stakeholders, the authors extend an existing viewpoint framework to capture emotions, and to use emotions in models from early-phase requirements to detailed software design. They demonstrate the models and framework with a case study of an emergency alarm system for older people, presenting a complete set of models for the case study. The authors introduce recent experience in using emotional models in requirements elicitation within an agile process.*

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## INTRODUCTION

Building interactive systems has never been more challenging with the increasing need to understand the social requirements of users. Most people-oriented systems involve a number of stakeholders. Each stakeholder has their own perspective of how the system should be developed. The differing views of stakeholders often conflict (Easterbrook & Chechik, 2001) and no set of requirements exists to satisfy all stakeholders. To accommodate social requirements and meet customer demands, many organisations are looking for innovative ways to change their strategic business processes (Baxter & Sommerville, 2011; Cernosek, 2004; Demoly, Monticolo, Eynard, Rivest, & Gomes, 2010). Andrade et al. (2004) state that to solve a complex problem, we first need to understand the problem through acquisition and conceptualisation activities. That is, we need to start by gathering as much information as needed about the context and then organise or model the information to provide a meaningful picture of the problem at hand. The resulting *conceptual model of the problem* represents the problem from the viewpoint of the *problem owner* (Andrade et al., 2004). Since there are multiple stakeholders in projects, there may be different, and possibly conflicting, models representing the different viewpoints of the multiple stakeholders. It is important to ensure that the conceptualisation process considers everybody's views and addresses any discrepancies that emerge.

Viewpoint modelling has been a technique commonly used by software professionals to resolve discrepancies during the requirements specification process. Viewpoint modelling enables the specification of a complex system by providing different viewpoints, facilitating communication with stakeholders at different stages (Andrade et al., 2004; Enders, Heverhagen, Goedicke, Tröpfner, & Tracht, 2002; Finkelstein, Kramer, Nuseibeh, Finkelstein, & Goedicke, 1992). In (Sterling & Taveter, 2009) a viewpoint framework is proposed based on agent-oriented models. The framework provides models at different stages of the software life cycle starting with the early-phase of requirements elicitation. In previous work (Lopez-Lorca, Miller, Pedell, Sterling, & Kissoon-Curumsing, 2014; Miller et al., 2014; Miller, Pedell, Sterling, Vetere, & Howard, 2012; Pedell, Lopez-Lorca, Miller, & Sterling, 2014), we have used the agent-oriented models proposed by Sterling and Taveter (2009) to present systems pertaining to different domains and involving different stakeholders. For example, Miller et al. (2012) use the models to illustrate a socially oriented system involving interactions between grandparents and grandchildren who are separated by distance.

In recent work, we have investigated the use of *emotional goals* to model the emotional viewpoints of different stakeholders in a project (Miller et al., 2014). Emotional goals are linked to *roles*, which represent stakeholders in the system, and specify a desired state of emotion or wellbeing of an agent playing those roles. Emotional goals represent how *people* feel, so are a property of people, not of the system. In a case study of an emergency alarm system for older people (Pedell et al., 2014), we demonstrated that by failing to consider the emotional goals of users, modern emergency alarm systems failed in their objective of keeping older people safe, despite being well-engineered and highly reliable systems. For example, many older people choose not to wear their emergency alarm pendant, due to the emotional stigma attached to it, so in an emergency they could not get help. We designed and implemented part of an emergency alarm system, a wellbeing monitoring system, based on our findings and trialled the wellbeing monitoring system in the homes of nine older people. Our findings showed better user experience over existing emergency alarm systems.