

Feel It, Code It: Emotional Goal Modelling for Gender-Inclusive Design

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Abstract. Context and motivation: Organisational values such as inclusion are often explicit, providing a common language to guide behaviour and motivate employees. Personal values are often less explicit but do guide individuals' decisions, and when challenged they generate an emotional response. However, understanding organisational values and linking them to implicit personal values of employees can be challenging.

Question/problem: In this paper, we investigate the use of emotional goal models to act as a link between organisational and personal values.

Principal ideas/result: We argue that when designing processes and systems for enacting organisational values, requirements engineers must consider the diverse personal values of the employees. We completed a case study within a multi-national organisation and identified pain points on career journeys which amplify the disparity of experience between men and women. We applied emotional goal modelling to elicit requirements for inclusive processes. We suggest that emotional goals can serve as a proxy for personal values and can support the formulation of requirements for designing processes cognizant of the organisational value of inclusion.

Contribution: Our empirical evaluation suggests that the modelling of emotional goals can support the operationalisation of values as requirements for gender-inclusive organisational processes and systems.

Keywords: Emotional Goal Modelling, Inclusive Design, Values

1 Introduction

Organisational values (*such as honesty, respect and diversity*) are usually explicit and documented. Personal values are often implicit and represent individuals' beliefs, reflecting what is important and serving as a guide for life choices [23]. When organisational and employees' personal values are aligned they make for positive work attitudes [22]. When activated, values become infused with feelings, which can be seen in emotional responses [23]. Lack of alignment between the values of organisations and the values of their employees can result in conflicts [12].

Many organisations, especially in male-dominated professions such as engineering and software development, advocate for greater gender diversity in the

workplace. There is an increasing emphasis on methods that identify gender-inclusivity biases within software (such as GenderMag [29]), but the socio-technical environment in which software is created is equally important [14]. In this paper we propose that understanding employees' values can help organisations design processes which reflect their values of *gender-inclusivity*.

Peoples' emotions play a significant role in the user acceptance of innovation [5]. Value-based Requirements Engineering (VBRE) uses emotions as cues to stakeholders' reactions arising from personal values to support communication processes [28]. However there is a lack of methods which use emotions to represent personal values as requirements in the design of processes and systems [17].

Emotional Goal Models (EGMs) build on requirements modelling to construct people-oriented models which show how users want to feel [15]. They have been successfully used to guide design in domains such as health [15] and homelessness [3]. In this paper, we focus on organisational processes and build on EGMs for identifying emotional goals as requirements for gender-inclusive processes. We investigate the following research questions:

RQ1: Can emotional goal models serve as requirements for design of a (software) system that promotes inclusion within the organisation?

RQ2: Can emotional goals contribute to a method for representing personal values as requirements?

To address those questions, we conducted an empirical study to understand the emotional experience of men and women in the organisation and extract the broad patterns that are important and relevant for the conception, design, and development of gender-inclusive processes. Mapping the experience of men and women during their career highlighted disparities at onboarding, development, and promotion. To translate employees' experience into tangible goal-driven requirements, we used EGMs to represent the functional, quality and emotional goals of employees during onboarding processes. We then evaluated the emotional goals generated and their link to employees' personal values. The contributions of this paper are twofold:

- *Applying emotional goal modelling to design gender-inclusive processes.* We propose a novel application of EGMs to the design of organisational processes that reflect emotional goals of men and women who experience those organisational processes in differing ways.
- *Evaluation of emotional goals for their representation of personal values within goal modelling.* We extend EGM to propose a method of eliciting and reflecting on emotional goals relationship to personal values. We reflect on the use of emotional goals to operationalise value requirements for the design and development of processes and systems that align organisational values and the personal values of its employees in the context of gender-inclusivity.

The remainder of the paper is structured as follows. Section 2 reviews related work. Section 3 presents the empirical study for mapping employees experience. Section 4 explains how we leverage EGMs to identify gender-inclusive require-

ments. Section 5 discusses the findings, lessons learned, and implications for requirements engineering (RE). Section 6 concludes the paper.

2 Background and Related Work

“Values are individual representation of societal goals. As elusive societal goals change, individuals’ values will sometimes lead and sometimes reflect this change” [10]. Schwartz’s theory of basic values is the most commonly applied within software engineering [24]. It identifies 10 value categories described by conceptual definitions in terms of motivational goals.

Goal modelling has emerged as a promising technique to operationalise values in software engineering [21] [18]. ‘Soft goals’ have been used to represent non functional requirements such as trust in agent-oriented models [31]. Goal models can also be used to understand value trade-offs based on software features [21].

However, these approaches do not address the values of the processes surrounding the creation of software. In this paper, we build on Schwartz’s theory of values [24] to represent personal values within organisational processes for onboarding.

To operationalise values such as *inclusion*, organisations implement support structures such as mentoring, networking and senior leadership sponsorship [8]. However, there is a lack of systematic processes to link organisational and personal values and reflect these as requirements to design inclusive organisational processes. This paper seeks to define such a systematic process.

Emotional goal modelling builds on requirements modelling to capture the emotional needs of users and construct people-orientated models that show how users want to feel [15]. They serve as high-level representations of the functional, quality and emotional goals of stakeholders, making them suitable for informing technical design. EGMs can be used as communication tools to assist in developing a shared understanding of a problem. They have also been applied within ‘living labs’ which support co-creation between stakeholders and development teams during the design process [20]. Emotional-led domain modelling has been considered to represent needs of diverse users (e.g., age, culture, personality, emotions) with adaptive software [7]. However the method lacks a way of ensuring emotions are linked to design and implementation decisions and features. In platforms for enhancing social interaction, successful applications have been found to be driven by user emotional engagement. A key challenge is to capture and understand users’ emotional requirements so that they can be incorporated into interaction design [25].

Psychologically-driven requirements engineering assigned value goals based on peoples’ roles in specific contexts, and emotional goals based on responses toward the occurrence of values within a system [1].

The study of affective computing and affective states in requirements engineering recognises the role emotions play in acceptance and negotiation activities [6]. However, there is a lack of modelling techniques that consider emotional

goals as a means of representing personal value requirements within organisational processes. In this paper, we build on existing EGM methodology to evaluate a link between emotions and personal values within organisational processes.

3 Capturing Disparities in Employees Experience

This section presents the empirical study we conducted to understand employees' experiences of joining and working within the organisation. We start by describing the multi-national organisation in which the study took place. We then report on how we identified the key disparity between men and women's experience.

3.1 Study Setup

We identified participants from a large manufacturing organisation. The organisation involved is highly automated, heavily reliant on its software technology and committed to equality and inclusion for its workforce. The study was set up to look at the experiences of employees and investigate respective viewpoints of their career journey. We interviewed 11 employees, 6 women and 5 men, from a cross section of Engineering (7), Quality (1), and Operations (3) functions. The engineers' experience ranged from graduate entry level through to senior leadership. They included 4 engineers (1-4 yrs experience), 4 mid-career middle managers (5-10 yrs experience) and 3 senior managers (greater than 10 yrs experience). In this paper we will refer to the participants as employees. Interviews were semi-structured, and lasting between 50 - 70 minutes and were conducted over a 3 month period. While prior studies have focused on uncovering bias within software teams [30], we focused on broader organisational representation to capture a diverse range of viewpoints.

We used thematic analysis [2] as a systematic method to analyse and code the responses of participants. It is an iterative method of analysis and synthesis allowing patterns and themes of the employees' experience to be identified. It consists of three main phases: *descriptive, interpretative and thematic*. In the descriptive phase, we transcribed all interviews and established initial codes based on the quotations and continued to develop these as we worked through the interview transcripts. In the interpretative phase, we categorised the data with similar codes into subthemes, we identified 42 subthemes, such as *building confidence, building trust, role models and self induced pressures*. We grouped and regrouped different codes to identify patterns in the data and create meaningful themes describing how interrelationships between people and contexts fit together. In the thematic phase, we created a descriptive story using excerpts of interviews to describe the employee experience. Further details about the analysis can be found in Hassett (2018) [8] [9]. We structure the findings as employee experience maps [27] which allow us to visualise and contrast experiences.

3.2 Experience Mapping

We used positive and negative sentiment [11] to reflect employees’ experience as shown in Fig. 1. We identified three key themes in the employee experience: *onboarding*, *development*, and *promotion*. Within these, subthemes were identified in the iterative coding process and plotted along the x-axis. Onboarding (when new to the organisation) includes three subthemes: introduction, getting experience, and developing networks. Development includes the following subthemes: identifying career paths, developing expertise, utilising networks and opportunity. Onboarding (when promoted to a new role) includes four subthemes: onboarding for promotion, supports, personal change, and being an ambassador.

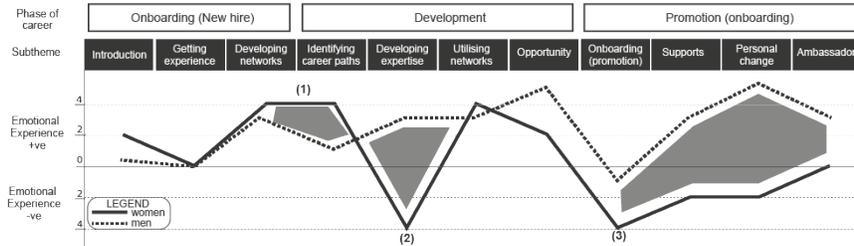


Fig. 1. Mapping Employee Experience

An example of a positive quotation is “*having someone you can talk to, in kind of an informal everyday basis*”. An example of a negative quotation is “*Moving into the team leader role. I think we could do with a bit more support definitely, and guidance*”. The y-axis scale is the scaled relative quantity of positive or negative quotations associated with each group for that subtheme rather than graded on magnitude of emotion. For example, in *development: developing expertise*, there were 3 positive quotations (from men) and 4 negative quotations (from women), this corresponded to a disparity in experience illustrated by the greyed area in Fig. 1. When the experiences were categorised, we observed disparity between men and womens’ experience at three points.

- (1) During *onboarding*, women actively network, seek out mentors, and contacts to discuss technical and career areas. Men are less worried about networking, with more informal “organic” networks.
- (2) During *development*, men were assigned more technical tasks whereas female employees took more organisational / procedural tasks. For example, there were two employees with the same engineering qualification; the man was assigned to Operational Support (fixing, designing, changing), the woman was assigned to Quality Engineering (assessing risks, authorising changes). In this case, the woman described her experience “*I needed to know more, won’t speak up even if know answer is correct*”. While the man indicated more confidence “*Because even the shot in the dark, I have more information about the shot in dark*”.

- (3) The *promotion* from engineer to manager reflects the most significant career transition. We found that the support of a close network of like-minded peers to provide informal advice and discuss challenges, helped employees adapt to the transition. The availability and benefits of informal support to men at promotion was evident, e.g., “*Without an ounce of doubt, my peers and colleagues have been a major support for me, the fact that other peers may have gone through the same experience, the fact that I am able to sit down and have a chat and go through*”. This compares starkly with the experience of one woman, who describes “*I would have reached out for help sooner*”.

We will now look to translate these (emotional) experiences (such as inconsistent onboarding processes) into goals for gender-inclusive processes.

4 Applying Emotional Goal Modelling to Design Inclusive Processes

The data from thematic analysis is rich and detailed but lacks interpretative power [4]. We used EGMs to translate employees emotional experience into desired functional, quality and emotional goals. The emotional goals capture the desired feelings of stakeholders within a socio-technical system and how they relate to one another [15].

Emotional goals are defined as “*the desired reflective level emotion of a role*” [15]. This definition relates to Normans’ three levels of emotions which are visceral, behavioural and reflective [19]. Emotional goals differ from functional goals and non-functional quality goals which represent intended properties of the system that affect the behavioural level [15]. The employee experience map identified disparity between men and womens’ emotional experience during onboarding, development and promotion. We now develop and propose EGMs to address these disparities, and design the organisational process of onboarding to create more gender-inclusive experiences for employees. We will now describe the modelling phase in which we identify and capture functional, quality and emotional goals to create EGMs (RQ1). We then describe how we evaluated emotional goals as a link to personal values (RQ2).

4.1 Modelling

The first stage in creating EGMs was to analyse the coded interview responses from the thematic analysis, extract key themes and identify them as functional, quality or emotional statements. These are coded as *do* (functional), *be* (quality) and *feel* (emotional) goals. The second step of the EGM analysis was to create future-based “should” statements and assign these to the relevant quote [9]. The following is an example of how an employee quote was transformed into functional, quality and emotional goals for the theme of *onboarding*:

- Quote: “*Sometimes success can be a failure. You can fail but you can learn something out of it which will be the next big success. We don’t seem to manage that very well.*”

- Subtheme: learn from failure/experience approach
- Goal type: feel (emotional)
- Goal (should statement): acceptance to make mistakes

The final stage was to create the model to represent the functional, quality, and emotional goals associated with stakeholder roles (such as manager, employee, engineer). We followed three steps: (i) moving from left to right of the figure, place stakeholders, functional goals on model, (ii) add the quality and emotional goals and connect related functional goals, and add the process outcome. Finally, (iii) assess and iterate the model to ensure goals and interactions make sense and the model can be easily understood by stakeholders.

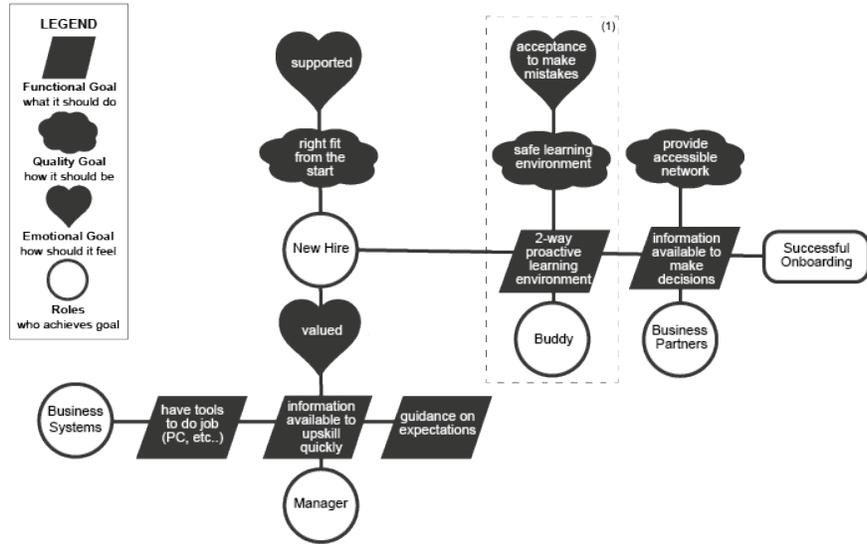


Fig. 2. Emotional Goal Model for Onboarding

Fig. 2 depicts the EGM describing the set of functional, quality and emotional goals for stakeholders in the onboarding process. It makes explicit those goals to support the organisational value of *inclusion*. We use notation for motivational goal modelling [13, 26]. Relationships between goals and stakeholders are indicated by non-directional connector lines. This is to visually represent the multiple interactions within the EGM and allow the model to be understood by non-technical stakeholders. The stakeholder (or “role”) shape represents an individual/organisation. The functional goals are represented by a parallelogram. Quality goals are represented by a cloud. Emotional goals are represented by a heart. There were six functional goals, three quality goals and three emotional goals. The outcome is ‘successful onboarding’. Stakeholders include *new/promoted employee, manager, buddy, business partners and systems*. In this EGM, the functional goals describe what the process **should do** (e.g., ‘correct tools to do the job’ and ‘access to information’). The quality goals describe how

the process **should be** (e.g., ‘to provide accessible network’ and ‘safe learning environment.’) The emotional goals describe how the process **should feel** and include ‘supported’, ‘valued’ and ‘acceptance to make mistakes’.

From the EGM, we generated goal statements such as ‘Buddies need to create a safe learning environment for the new hire, while letting them have access to a proactive learning environment where it is acceptable to make mistakes’ (refer to (1) on Fig. 2). Another EGM was also generated for development [8].

4.2 Mapping Emotional Goals and Personal Values

We then performed an evaluation of emotional goals generated within the EGM to link with personal values definitions [24] using value terms [23]. We proposed an initial mapping of emotional and value goals for inclusive processes. We aligned functional, quality and emotional goals from the EGM as shown in Fig. 3. Functional and quality goals supported fulfilling the emotional goals for onboarding and development. For example, the functional goal of ‘2-way proactive learning environment’ and quality goal of ‘safe learning environment’ aligned with the emotional goal of ‘acceptance to make mistakes’. Within the context of the stated functional and quality goals, this emotional goal aligned with the value goal ‘self-direction - freedom to determine ones own actions’. To support the organisational value of *gender-inclusion* we assigned the value goals based on alleviating the negative experience of women.

Organisational process outcome	Functional goal	Quality goal	Emotional goal	Value goal
successful onboarding	information available to upskill quickly	right fit from the start	valued, supported	personal security - feeling others care about me, a sense of belonging
successful onboarding	2-way proactive learning environment	safe learning environment	acceptance to make mistakes	self-direction - freedom to determine ones own actions
successful continuous development	enable supportive team environment	ability to develop networks	inclusive	universalism - concern, equality for all
successful continuous development	opportunity to display own work	bringing new/ diverse opinion	you can make a difference	self-direction - freedom to determine ones own actions

Fig. 3. Mapping Emotional and Value Goals for Inclusive Processes

To represent *gender-inclusion* as an organisational value goal, we were able to successfully align emotional goals ‘supported’, ‘valued’, ‘inclusive’, ‘acceptance to make mistakes’ to personal values goals of ‘personal security’, ‘self-direction’, ‘universalism’ and ‘self-direction’ respectively. The linkage between emotional goals and value definitions provides process-related requirements that the organisation can use to realise the desired value of inclusion.

We propose and demonstrate a systematic process for linking an organisation value of *gender-inclusion* to employees' personal values via emotional goals.

4.3 Threats to validity

We now discuss some threats that might challenge our findings.

- *Sample size and selection criteria.* The selection was limited to 11 participants as no new subthemes and categories were emerging, representing theoretical saturation. As this study focused on gender inclusive representation of men and women, we would recommend future studies incorporate GenderMag assessment as well as hybrid working models [29].
- *Coding and thematic analysis.* The interviews were transcribed and coded by one researcher. To minimise reliability bias, sample transcript was cross checked with a second researcher to ensure factual interpretation.
- *Generalisability.* While these results are from one organisation, we are unable to say if they can be generalised and further studies would be required.

5 Findings and Lessons Learned

In this paper, we used emotional responses to identify disparity in the experience of men and women employed in a multinational organisation. We suggested that this emotional response is in part due to misalignment between the values of the organisation and those of employees impacted by the current processes [23]. This section discusses findings, lessons learned, and their implications for requirements engineering.

5.1 Findings

We now reflect on how our work addresses the research questions posed in section 1.

RQ1: Can emotional goal models serve as requirements for design of a (software) system that promotes inclusion within the organisation?

Using the organisational value of *gender-inclusion* we used emotional goal models to design gender-inclusive processes for onboarding (and development). We found that employees wanted to feel '*valued*', '*supported*', and that it was '*acceptable to make mistakes*'. We propose that EGMs can represent a high level goal model which make explicit the functional, quality and emotional goals within organisational processes.

RQ2: Can emotional goals contribute to a method for representing personal values in organisational processes?

We evaluated emotional goals as a link to personal values and provided linkage between emotional goals and personal values for inclusive design. The emotional goals '*valued*', '*supported*', and that '*it was acceptable to make mistakes*' aligned with values of '*personal*

security’ and *self-direction*’ respectively. While our work was limited to one organisation, and limited to men and women gender participants, the results are encouraging. We suggest that emotional goals can serve as a proxy for personal values and can support the formulation of requirements for designing processes cognizant of the organisational value of *gender-inclusion*.

5.2 Lessons Learned

We now discuss in more detail some challenges identified during the process of designing EGM and mapping them to values.

Conflicting values. We identified two sources of conflicting values. Firstly, to meet the organisational value of *gender-inclusion* we linked the emotional goal of feeling *valued*’ to the personal value *personal security*’. However, when we consider the positive experience of men, the same emotional goal of feeling *valued*’ could have been associated with the value of *benevolence - being a reliable and trustworthy member of the ingroup*’. This values decision poses a challenge for RE during design of organisational processes and systems. However, we propose that maintaining alignment with the higher level organisational value of *gender-inclusion* can ensure that under-represented groups are considered explicitly. Secondly, we found the emotional goals of *valued*’ and *acceptance to make mistakes*’ represented values of *personal-security*’ and *self-direction*’ respectively. When placed within Schwartz’s value continuum, these would be in conflict [24]. We believe the inclusion of emotional goals in requirements gathering offers an opportunity to mediate values conflicts and trade-offs.

Emerging values. When evaluating the EGM for onboarding, there was an absence of ‘system’ level goals such as *privacy and autonomy*. As with any RE process, designing with values and emotion is an iterative process. As we are developing from organisational processes to a specific software system context, additional values and emotions may emerge and will need to be considered and integrated into the goal models. Therefore we propose future work (i) using EGM-led prototypes, and (ii) iterating EGMs with stakeholders, to understand how new emotional goals and personal values surface. Existing RE tools and methods will need to be reviewed to integrate and maintain these emergent requirements.

In summary, the evaluation of emotional goals as representation of personal values within organisational processes identified two key challenges, those of conflicting values and emerging values. We propose future work to include use of emotional goals to mediate value trade-offs and supporting ongoing design iteration using EGMs and EGM-led prototypes early in requirements gathering. In other words, emotional goals offer an approach to translating employees’ lived experience during career development into values requirements for software systems.

5.3 Implications for RE

As society evolves, so do its values and priorities. To adapt, RE needs to consider not only what values to prioritise, but how these values are reflected in practice [16]. Emotions provide one representation of personal values. Modelling them as requirements necessitates reflection on existing RE methods and techniques to investigate how they can be extended to be more explicit in representing and reasoning about different values. *Inclusion* represents an example of an organisational value that reflects societal values. The redesign of organisational processes informed by emotional responses of stakeholders will benefit society. However, it can also lead to challenges. For example, prioritising some values, such as *inclusion* above immediate economic value, can be disruptive to traditional approaches of prioritising requirements. Indeed, expanding to consider other organisational values such as *sustainability* will require existing methods to adapt in order to incorporate an additional set of complex value requirements, whose costs and benefits can then be more systematically considered.

6 Conclusion

This paper presented a systematic approach to design gender-inclusive processes using emotional goals to link organisational and personal values. It takes a step towards making requirements of personal values explicit through emotions. It thus provides an approach to operationalise employees' personal values.

The results can be extended in a number of ways. These include evaluating if emotional goals can be used to link other organisational values such as *sustainability* with personal values. We plan to extend the work to consider conflicting and emerging values within EGM by (i) prioritising emotional goals when personal values are conflicting, and (ii) analysing the use of EGMs and EGM-led prototypes to surface emotions and values early in the requirements engineering process. Our ambition is that by designing inclusive organisational processes, then the products, the services, and ultimately the software that these organisations create, will reflect values of the society that we want to live in.

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