Bridging User-Centered Design and Requirements Engineering with GRL and Persona Cases

Shamal Faily

Department of Computer Science, University of Oxford
Wolfson Building, Parks Road, Oxford OX1 3QD UK
`shamal.faily@cs.ox.ac.uk`

Abstract. Despite the large body of i* research, there has been comparatively little work on how goal-modelling techniques can help identify usability concerns. Recent work has considered how goal models might better integrate with User-Centered Design. This paper takes an alternative perspective by examining how work in User-Centered Design, specifically Persona Cases, can be re-framed as goal models. We briefly describe an approach for doing this, and present some preliminary results from applying this approach using the Goal-oriented Requirements Language and existing tool support.

1 Introduction

i* and related agent-oriented requirements engineering techniques are useful for modelling complex relationships between social agents and intentional concepts. Surprisingly, however, there appears to be comparatively little work on the usefulness of these techniques for eliciting concerns affecting the usability of systems for its participating users.

Previous work has considered how i* might be integrated with User-Centered Design techniques to facilitate communication between requirements engineers, stakeholders, and designers [1]. This work argues that such an approach adds a creative element to the engineering perspective associated with goal-oriented techniques. Follow on work by Leonardi et al. [2] proposes the use of visual scenarios to contextualise Tropos models, and using personas [3] to fulfil the role of actors. Personas are behavioural specifications of archetypical users which embody their needs and goals; since their initial introduction by Cooper [3], personas have become a mainstay in User-Centered Design. Leonardi et al. identify several issues associated with translating formal models to more engaging artifacts like scenarios, but attention also needs to be paid to the validity of the personas used. If personas are not carefully developed then criticisms about their validity may also threaten the validity of any artifacts they influence [4].

Persona Cases have recently been proposed as a technique for providing independent validation of personas [5]. Persona cases are personas whose characteristics are both grounded in, and traceable to, their originating source of

empirical data. As a validation tool, persona cases are built on the premise that sense-making in qualitative data analysis is an argumentative activity, and the elements of Grounded Theory [6] can be re-framed as an argument using Toulmin's model of argumentation [7]. Expressing persona data using i* can also provide a means of validity by eliciting intentional relationships that support or challenge aspects of a persona's behaviour. However, aside from providing a means for persona validation, there are three additional reasons why integrating this work with i* and related goal-oriented approaches might be useful from a design perspective.

First, given the analogies that can be drawn between i* and other approaches for design rationale, and Toulmin's model being the basis upon which these approaches are built, it seems reasonable to expect alignment between i* concepts and persona cases. Alignment between concepts may allow qualitative models to be re-framed as goal models in the same sense that they can currently be re-framed as persona skeletons.

Second, current efforts to support interchange between different i* modelling tools also facilitate the generation of goal models by requirements management tools that support aligning concepts.

Third, because goal models provide an alternative way of contextualising personas, an integrated approach benefits UX (User Experience) designers as well as requirements analysts. When augmented with tasks that stakeholders might carry out, designers may be more interested in using these models to understand user activities in context [8] rather than as a vehicle for directly eliciting requirements. Consequently, framing goal modelling as a UX design technique may lead to an expanded audience for i* and related techniques, who may identify hitherto unseen affordances in both goal models and goal modelling techniques.

In this short paper, we describe preliminary work bridging User-Centered Design and Requirements Engineering by re-framing persona cases as goal models. In section 2, we describe our research objectives and the research approach adopted before describing our contributions to date in section 3. We summarise these contributions in section 4, and describe on-going work in this area.

2 Objectives

The objectives of this research are two-fold.

First, we want to better understand how personas and associated concepts align with i*. Unlike previous work, we wish to align concepts *to* i* rather than the other way around; this is because we are considering i* as a tool to support User-Centered Design, rather than vice-versa. Because personas are often described using scenarios, we expanded the scope of analysis to include use cases carried out by personas. Because previous work suggests that goal models align with use cases [9], it is possible that the alignment relationship between goal models and use cases is bi-directional.

Second, we want to understand how existing tool support can exploit these relationships such that goal models can be automatically generated based on pre-existing analysis. As a baseline for this research, we use the Goal-oriented Requirements Language (GRL) as the goal-modelling language for aligning concepts, and the jUCMNav [10] Eclipse plugin because of its support for importing XML based GRL files. The CAIRIS tool [11] was used for managing persona case and use case elements, and generating GRL files.
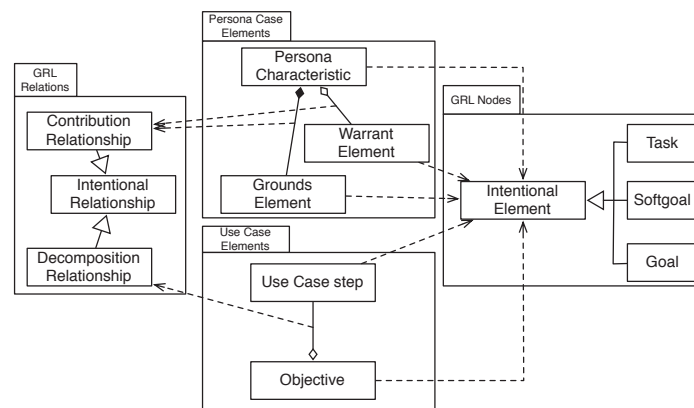
3   Contributions

Fig. 1. Conceptual relationships between persona case and use case elements with GRL

To date, we have made contributions to each of our research objectives.

We identified several aligning relationships between persona case and use case elements and GRL; these are summarised in figure 1. The elements in this model align with concepts from the IRIS (Integrating Requirements and Information Security) meta-model: a conceptual model aligning elements from Requirements Engineering, HCI, and Information Security [12].

Because the [long] names associated with persona characteristics and their supporting elements are displayed on a goal model, a short synopsis was associated with each; a similar synopsis was assigned to each associated use case objective and step. As figure 1 shows, each stipulated persona case and use case element was associated with a GRL intentional element. To date, our preliminary research has considered only the sub-set of tasks, goals, and soft-goals as candidate aligning elements.

To support the bounding of elements associated with i* Strategic Rationale models, persona characteristic synopses and supporting elements were automatically bounded by persona name. Synopses associated with use case steps were

associated with either personas or concepts associated with the system being designed.

Associations between persona characteristics and their supporting argumentation elements were aligned to GRL contribution relationships. Our initial work indicates that GRL contribution relationships are semantically richer than the relationships between persona characteristics and their supporting grounds and warrants. For this reason, it was necessary to associate the navigability between elements in the contribution relationship with each characteristic-grounds and characteristic-warrant relationship, together with the strength of the contribution. This strength is based on the qualitative contribution values associated with GRL; these range from *Make* and *SomePositive* to *SomeNegative* and *Break*. At present, the analyst is responsible for deciding both the navigability direction and the strength of the qualitative contribution. This decision is based on the use case's impact on the persona, and activities related to both the persona and the use case. Associated with each use case step is a decomposition relationship between the intentional element associated with the use case objective and the element associated with the step.

Figure 2 shows a partial goal model reflecting one characteristic of a persona (Helen) that personifies a mother of a young child. The figure shows how the characteristic *Maintain work-life split* is modelled as a soft-goal, and the grounds contributing to it are modelled as goals which help or make this soft-goal. The figure also illustrates how this characteristic is a means for the soft-goal *Mother young child*; this soft-goal is a warrant for the characteristic. The figure also shows how the step *Set device to sharing* associated with the *Content sharing and storage* use case hurts one of the goals contributing to Helen's ability to maintain a work-life split.
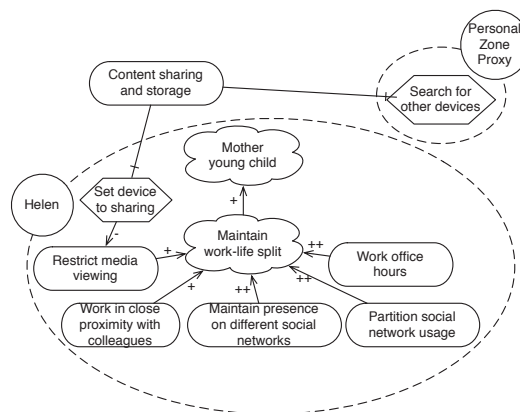

Fig. 2. Partial i* model of a persona characteristic and related use case steps

CAIRIS was updated to support the association of synopses with persona case and use case elements, and the association of the requisite contribution link attributes – contribution direction and strength – to each characteristic-grounds and characteristic-warrant association. The tool was also updated to allow a GRL model file to be generated for a selected persona and associated use case. When models are imported into jUCMNav, additional contribution links were added to elements associated with use case steps to indicate whether these help or hinder persona goals or tasks. Such links are added at this late stage as these may not be obvious until the initial goal model is displayed. Figure 3 illustrates a complete GRL model generated by CAIRIS and imported into jUCMNav for all of Helen's characteristics and all steps of the *Content sharing and storage* use case.

4   Conclusion and Ongoing Work

This paper presented an approach for generating goal models from persona cases and their associated elements. We described how persona case and use case elements align with complementary elements of GRL, and demonstrated how existing tool support can take advantage of this alignment to generate GRL models from pre-existing model data in CAIRIS.

As part of the EU FP7 *webinos* project, we are currently using this approach to model the impact of personas carrying out use cases which help or hinder their personal or occupational goals. Insights gleaned from this and other goal models are currently being used to develop scenarios illustrating the unintentional impact of webinos to prospective users and their security and privacy expectations.
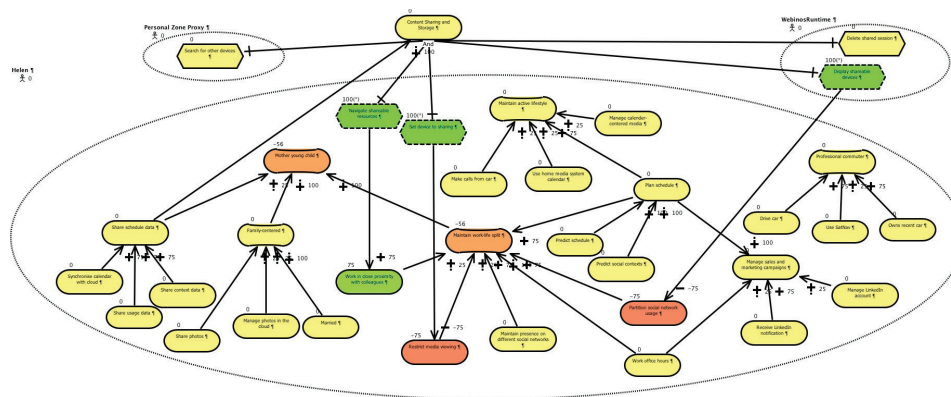

Fig. 3. Generated GRL model displayed in jCUMNav based on a persona case and an associated use case modelled in CAIRIS

5 Acknowledgements

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