The PRISE Tool to Support iStar Extensions

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Abstract. iStar has been extended since its initial proposal in the 90's. It is worth noting that since 2016 the language notation is under standardisation. However, new extensions continue to be proposed. The search for previous extensions and its constructs can be a starting point in the proposal of new ones. **PRISE** (**PR**ocess to conduct **IS**tar **E**xtensions) consists of a set of tasks, artefacts and templates which can be used when one needs to propose extensions which are more complete, consistent and without conflicts. The objective of this paper is to present a tool to support the proposal of iStar extensions based on PRISE. The tool helps to create projects of extensions and update the information about the performed tasks, as well as the information of the artefacts to be filled by the extender. The results suggest that **PRISE Tool** can be very useful to manage the iStar extensions.

Keywords: Requirements, iStar extensions, Process, Tool.

1 Introduction

iStar is a goal-based modelling language used to model requirements at early and late phases of software development. Since its proposal by Yu [14], the language has been extended to incorporate new constructs related to an application area. In 2016 we conducted a Systematic Literature Review (SLR) [5] which identified 96 extensions. The iStar community often uses part of the extensions to model systems or as the basis for other extensions.

Given the recent proposal of iStar 2.0 [2], we believe that this is the best moment to discuss how iStar extensions could be systematised. We are interested in improving the way of extending it. Thus, we have proposed PRISE, a process to conduct the iStar extensions. It is based on a set of previous results which analysed the iStar extensions such as the SLR about iStar extensions [5], a mixed methods study with

experienced extenders which resulted in the creation of a set of guidelines [6], some extension mechanisms for iStar [9] and a catalogue of iStar extensions [8].

Motivated by this scenario, this paper aims to present a tool to support the proposal of new iStar extensions based on the **PRISE** process. The **PRISE Tool** is important to help the management of the proposals of iStar extension by the extenders.

2 Background

In this section, we present some information about iStar extensions and the PRISE process.

There are different forms to present an iStar extension [5], but all of them introduce new concepts to iStar. For example, a set of extensions described in detail the new concepts and its representations in the iStar metamodel and concrete syntax (see works of Ali, Dalpiaz and Giorgini [1] and Morandini et al. [12]). This kind of extensions describes how the new concepts were introduced and how to use them.

On the other hand, a set of other extensions was presented as a method to create models, and the iStar changes are described using illustrations with the usage of new concepts. An example of this kind of extension is the work of Islam et al. [11].

Another set of papers presented a case study or a modelling tool with a set of new concepts introduced in iStar, for example in Gans et al. [4] and Siena et al. [13].
The objective of PRISE process is to conduct iStar extensions systematically and to produce them as complete, consistent and without conflicts as possible. We have involved the extenders of iStar community in the steps of this proposal and developed a set of works to identify how the iStar extensions had been performed and what could have been done to improve future iStar extensions.

Initially, we identified the existing iStar extensions by means of an SLR to identify and analyse them [5]. A catalogue of iStar extensions was proposed to join the iStar extensions and their constructs identified in the SLR about iStar extensions [8]. We have also performed a study to improve the proposal of future iStar extensions [6], the results were represented by a set of guidelines provided by experts in iStar extensions. PRISE also uses the results of the following works: towards extensions mechanisms in iStar 2.0, which proposes a set of extension mechanisms to be added to iStar 2.0 [9]; Finally, the results of an experiment and a survey for mitigating problems in previous iStar extensions [7]. We have also analysed the state-of-art of the modelling languages and extensions.

Therefore, we have considered these results in the proposal of PRISE, modelling an initial version of PRISE using BPMN. Moreover, PRISE was analysed by three experts in iStar extensions and five PhD students in computer science. Then we made the refinements of PRISE considering the suggestions. As a result, 71 out of 84 suggestions of corrections/improvements to PRISE were implemented.

PRISE guides the proposal of iStar extension systematically, enforcing the completeness, consistency and absence of conflicts of the proposal. An interactive version of this process is available in http://www.cin.ufpe.br/~ler/prise. In this link, it

is possible to view and iterate in all process and templates for the artefacts. The PRISE was also presented in detail by Gonçalves et al. [10].

3 Related Work

We did not find any tool to support the proposal of extension for the iStar modelling language. Therefore, we discuss a set of works associated to model languages approaches which are related to PRISE. We also analyzed tools to support the representations of extensions.

A catalogue of iStar extensions is presented in [8] which includes the iStar extensions and its constructs. This catalogue is important to ease the identification by the extenders of the existing extensions and constructs previously proposed, and its reuses. The catalogue is based on the results of our SLR [5] and it is used by four tasks of PRISE which are related to the search of extensions and constructs or to report the new extensions. It is available at http://istarextensions.cin.ufpe.br/catalogue/. However, our previous tool is not intended to support all tasks of PRISE.

Franch et al. [3] have defined an approach to join iStar with other MLs, presenting results of a search for the references that join iStar with other MLs and guidelines to be followed considering the theoretical, technical, methodological and community aspects. However, they do not present a tool to support their proposal.

4 The PRISE Tool

The PRISE Tool is part of a research which investigates how the iStar extensions have been proposed and what can be done to improve future iStar extensions. It is based on the PRISE process. In this section, we present the technologies and the tool architecture, as well as an overview of it.

We have used Laravel framework[1] for developing the catalogue of iStar extensions. Laravel framework is one of the most used frameworks and deploys layered architecture, promotes software reuse, agility in development using PHP.

Our new tool can be used by extenders who are using PRISE to create new iStar extensions or recreate existing ones. The **PRISE Tool** can be accessed at https://istarextensions.cin.ufpe.br/prisetool using Google, Github ou Facebook account or creating a new account

For an extender user, it is possible to create a new project to support a previous extension or to list the current projects. A new project requires name and description and generates a structure similar to PRISE process available at www.cin.ufpe.br/~ler/prise. The projects can be deleted or edited (name and description) as well.

The details of the extension present the main process of the PRISE process and five web forms, one for each sub-process: *Analyse the need for extension proposal,*

[1] https://laravel.com

Describe concepts of the iStar extension, Develop iStar extension, Validate and evaluate the iStar extension, Consult experts and Publicise the iStar extension. Each screen is composed of a diagram of the process on top and a grid with their sub-process/processes. For each activity (sub-process/task) there is a related template to be used by it and the input of the task, when applicable.

The tool displays he artefacts related to the input, the template and the output, when applicable. The templates are files which can be downloaded to be filled as an alternative way to continue developing the extension off-line. The outputs are the artefacts in an online and integrated way with the tool.

The outputs are links to forms which are open to be filled. Thus, a form is shown when the extender selects this option clicking on the link exhibited in the output column.

shows, as an example, the first screen of details of the project of an extension, in this case to *model rational agents*. The checkboxes on the left-hand side control the tasks/sub-processes performed. The list of the table is a set of links to the sub-processes' details (the exception is the *check other new constructs to be introduced* sub-process*)*.

This tool already has been used for the proposal of two extensions. The first one was an extension to model rational agents with different internal architectures and related entities, such as environment and organisation. The second one was the proposal of an iStar extension to model safety concepts in critical systems. We have identified eight problems related to the usage of the tool which were corrected. The tool was tested one more time and the problems did not occur. The tool was considered very useful by these users.

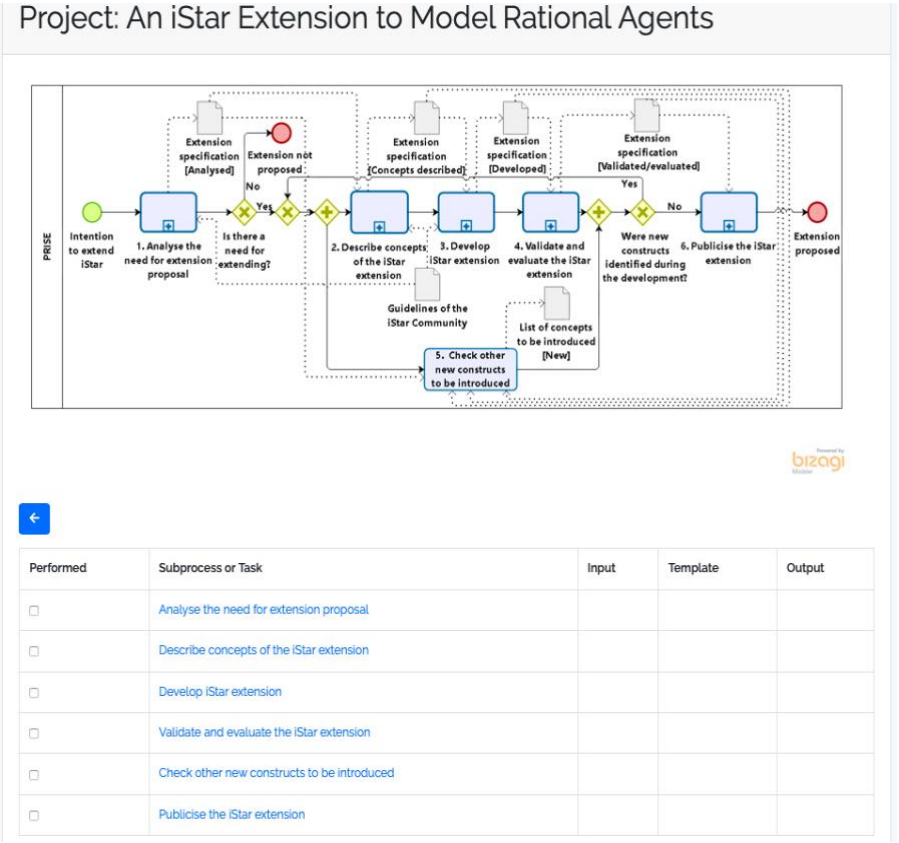

Fig. 1. Main process of PRISE in the PRISE Tool.

5 Conclusion and Future Work

In this paper, we have presented the PRISE tool, which enables the management of the iStar extension proposals by the extenders. The **PRISE Tool** supports the **PRISE** process. It makes available the templates and artefacts of PRISE process. It allows users to fill and save the artefacts on-line, with forms provided by the tool. It is possible to identify the tasks performed and the tasks which have not been performed yet. Additionally, tooltips are shown related to each task.

As a future work, we intend to integrate the PRISE Tool with the catalogue of iStar extensions to enable the publishing of the proposed extensions in the CATIE catalogue [8], which will be updated to maintain compatibility with the process. An extensive validation of the tool is planned for future work. We intend to use the tool to perform conduct the proposal of new extensions as another validation.

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