Repository Construction and Reuse of Software Requirement

Neunghoe Kim, Chanki Hong

Abstract: *Software reuse is not limited to reusing code used a lot but can be used in all steps and activities related to software production. In particular, the reuse of requirements has various benefits by reusing reliable requirements, and the development of requirements is an early stage of software development and may have higher efficiency than the utilization of reuse in later stages if reuse is utilized from the initial stage. However, despite its many advantages, the study on the reuse of requirements is insufficient. Therefore, to explore the possibility of the requirements reuse, we conducted a total of four stages in this paper: selection of targets and stakeholders, construction of requirements repository, reuse of requirements repository, and result analysis, and a case study of requirements repository construction and reuse was conducted. We have confirmed the fact that the reuse of requirements possible with a high proportion in practice through the application of actual case and we have also confirmed the possibility of research on the reuse of requirements. If we deal with the reliable requirements by increasing the utilization of requirements reuse, the possibility of the project's success will also be greatly increased.*

Keywords : Requirement engineering, Requirement repository, Requirement reuse, Software requirement.

I. INTRODUCTION

The software reuse firstly reduces development life cycle and enable to lower production cost in future development efforts. Second, by reusing correctly proven components, the system reliability is improved and the need for system testing is reduced. Third, the life cycle maintenance costs are reduced due to reduction in the ripple effect of program changes due to the design abstraction. Fourth, when creating new programs and designs, it enables the developing organizations to retrieve their investment to current software systems [1], [2]. Based on these many benefits, many studies and attempts on the reuse of software have been carrying out. Software reuse is not limited to code reuse only as it is already in use, but is subject to all the stages and activities that produce the software [3]. Reuse of requirements has many parts that can be reused in relation to requirements and

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also includes the benefits of general software reuse. By reusing reliable requirements, review times can be saved, approval cycles can be accelerated, and project activities such as testing can be completed quickly [4]. In particular, if the development of requirements uses a reuse from an early stage of software development, it may have many efficiencies totally than the utilization of reuse at a later stage. As such, the reuse of requirements has many advantages, but the current situation that the related studies are insufficient. In this paper, a requirement repository has constructed and a case study for reuse has conducted to explore the possibility of study for reuse of requirements. The appropriate subjects and stakeholders has selected and the requirements repository has constructed with requirements likely to be reused and the requirements repository has reused through pilot project, then the results were analyzed trough two items.

II. REPOSITORY CONSTRUCTION AND REUSE OF REQUIREMENT

In order to find out the possibility of the construction of requirements repository and reuse, we have designed and study them in total four stages: selection of targets and stakeholders, construction of requirements repository, reuse of requirements repository, and result analysis, as shown in Figure 1.

A. Selection of Targets and Stakeholders

The software that was previously released by the enterprise and have a plan to release similar software products in the future was selected as a candidate group and the one subject was selected for this study. The stakeholders closely related, such as those with knowledge or with experience in development of the software selected were selected. This study was selected for database security software product and 9 stakeholders were selected and carried out the study together.

B. Construction of Requirements Repository

Requirements that are likely to be reused in the future with stakeholders were driven from selected software. The requirements were only for the requirements that were included in the product to be released, and it selected after discussion by stakeholders. The selected requirements have been entered into the requirements repository with relevant data in accordance with the registration format of the requirements repository and registered in requirements repository. In this study, 106 requirements that are likely to be reused in security software products were stored in the requirements repository with relevant data.

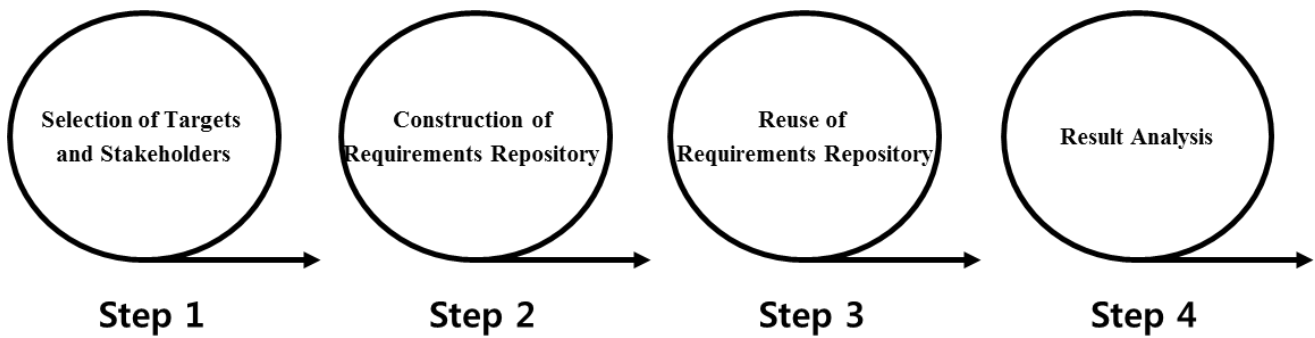## Repository Construction and Reuse of Software Requirement

Fig. 1.Procedure of the construction of requirement repository and reuse.

C. Reuse of Requirements Repository

Prior to the application of product development planned for new releases, the pilot project for the development of the similar software product was conducted using the requirements repository. Indeed, it was conducted the same procedure as is used to develop software products in the enterprise, and there were only differences in using the requirements repository from the beginning of the procedure compared to before. Because it is just pilot project and the study is limited to the requirements development stage, it was conducted only until the requirements development stage.

In this study, the 97 requirements among the requirements in requirements repository were reused in pilot project, with one additional requirement and nine changed requirements.

D. Result Analysis

Results were analyzed through two items based on the studies of the stages carried out. One of 2 items is how many of the requirements in the requirements repository were reused for the project, and the other one is, how many requirements in the project requirements have been reused. The two items were analyzed based on recorded data from the requirements repository.

In this study, 91.5% of the requirements for the requirements repository were reused in pilot project, and the reused requirements for pilot project was 90.7%.

III. RESULT OF CASE ANALYSIS

The 2 items set up and analyzed in this study in order to identify the possibility for the construction of requirements repository and reuse are as follows.

1. How many requirements in the requirements repository were reused for the project?
   (Number of reused requirements/Number of requirements in requirements repository)
2. How many requirements in the project requirements have been reused?
   (Number of reused requirements/Number of requirements for project)

The results of the analysis based on the data obtained from the previous studies on the above two items are as follows.
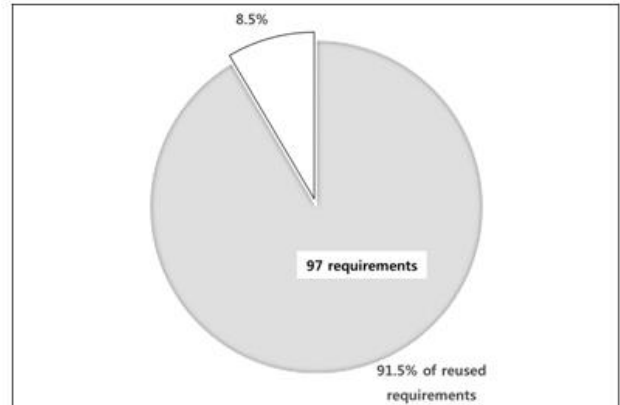
(1) Percentage of requirements reused for project in a requirement repository
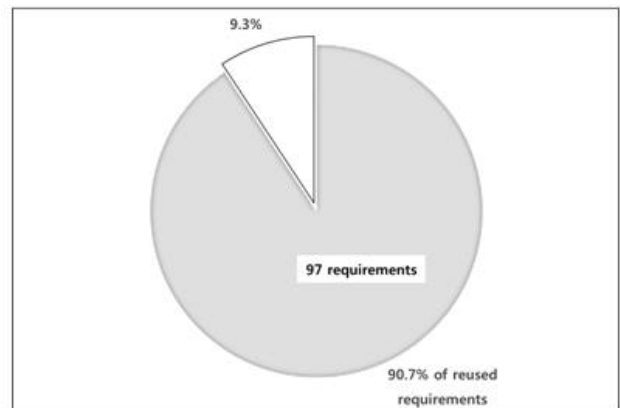
(2) Percentage of requirements reused among the project requirement

Fig. 2.Result of analysis on items.

Figure 2 (1) shows the percentage of requirements reused in a pilot project in the requirements repository. The requirements repository contains 106 highly reusable requirements, of which 97 are reused in the pilot project, representing a 91.5% reuse rate. Figure 2 (2) presents the percentage of the requirements reused in the pilot project. The number of requirements for pilot project were 107 and 97 of which have been reused, showing a high proportion of 90.7%. However, as mentioned in [5], the good results as like above can be achieved because most companies develop projects for similar purposes mainly in the same field. However, different results may be obtained if this study has been applied to projects in different fields or for different purposes.

IV. CONCLUSION

In this paper, we conducted a case study on the construction and reuse of requirements repository by conducting a total of four stages; selection of targets and stakeholders, construction of requirements repository, reuse of requirements repository, and result analysis to examine a possibility for the reuse of requirements. Through the progress of this study, we could confirm the fact that the requirement can be reused with an actual high proportion and, also confirm the possibility of study on the reuse of requirements. The problem with high proportion of reasons for project failure are those related to requirements. If we deal with the reliable requirements by increasing the reuse of requirements, it will also be helpful to the success of project. As a future research plan, we will investigate and analyze the reasons why it is difficult to reuse the actual requirements in the industry, and we will supplement the method of building and using the requirements repository so that the utilization of the requirements reuse can be increased.

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