Strategies of Prioritizing Requirements to Support on-Line Service Companies' Service Improvement Decision-Making

Dong Seok Oh, Hye Young Jeon, and Sung Yul Rhew

Abstract—To companies providing on-line services, decision-making to reflect service stakeholders' requirements accurately and rapidly is one of the most important factors determining the success or failure of a company as well as its services. Thus, this study proposes strategies of prioritizing service stakeholders' requirements, collected from users' opinions and analyzed, from end-users' perspective, business perspective and administrators' perspective. After refining and standardizing all the opinions expressed through mobile devices and webs, this study analyzed and classified the opinions into requirements and listed them. Then, this study firstly proposed priorities based on the frequency of end-users' requirements, secondly proposed priorities from business perspective by considering the attributes of requirements, and thirdly proposed priorities from a perspective of effect on service operation and management. Lastly, this study extracted overall priorities by summing up three indices of priorities proposed earlier. To verify the validity of procedures and techniques proposed, a case study was conducted, and as a result of carrying out a survey on the related workers, this study had the validity approved.

Index Terms—Prioritizing requirement, decision-making.

I. INTRODUCTION

In the on-line business environment developing rapidly, the main issue has shifted from platforms like hardware and OS in the past to user-centered services like mobile/web applications for smart devices [1]-[3].

For such a reason, on-line business service providers are establishing aggressive service systems through mobile/web, and users are using more services provided by these companies through various applications.

Especially, users can express their opinions to improve services actively through mobile devices. At the same time, companies have realized that reflecting users' various requirements on their systems rapidly and accurately will determine their success or failure, and accurate decision-making for developmental directions of services has emerged very important [3], [4].

Thus, researches are conducted mainly on extracting requirements from atypical requirements, like users' comments which are their active opinions, or refining and standardizing these requirements [5]-[7]. However, not many researches have been conducted on procedures and techniques to support decision-making in order to reflect standardized requirements on the improvement of services.

To effectively reflect refined and standardized requirements from users' opinions on the improvement of services, this study intends to propose strategies of prioritizing requirements from stakeholders' perspective in order to support the related decision-making.

II. RELATED WORKS

In addition to some researches on refining and standardizing not typical requirements but atypical opinions collected through mobile/web into requirements for the improvement of services, other researches have been already conducted on prioritizing and evaluating extracted requirements so far.

Through his study, Byeon Jeong-Won proposed a process and techniques to extract requirements from users' opinions [6]. Based on a framework for the development of requirements, his process receives users' unclear and atypical requirements and classifies them into requirements, while determining the degree of contribution by refining and systemizing them, which showed greatly-advanced aspects than previous researches. However, since the techniques provided are mostly statistical ones, they are quite abstract in a process of prioritizing requirements used for decision-making in actual fields and analyzing the validity of requirements.

Out of all the researches on prioritizing and evaluating refined and standardized requirements, Kim Tae-Hyun's research evaluated units used to measure the value of requirements by dividing them into customers' aspect and project aspect. In customers' aspect, his method is used to evaluate the value of services provided to customers and their satisfaction of expected product quality. In project aspect, his method is used to evaluate if a project team can reduce expenses and technical risks [8].

Park Pyeong-Su's research is a way of evaluating users' requirements by an analysis of usecase weighted values, and it evaluates users' requirements by using the weighted value of usecase in the stage of analyzing requirements. By analyzing relevance through a mapping table between usecase and requirements, his method is used to analyze the weighted value of usecase and evaluate and distinguish requirements [9]. However, this research failed to consider some parts that might differ depending on the complexity of a system, and its process of defining usecase was not clear. As a result, it is advantageous to verify various initial requirements from users, customers and developers, but not...
proper to be applied to software and services in operation at present.

III. PROCESS OF PRIORITIZING REQUIREMENTS IN SERVICE STAKEHOLDER’S PERSPECTIVE

When users who have experience services post comments, they can play a very important role in improving or maintaining and correcting services [7]. 70% of all the comments on average are abstract or unclear, but the remaining 30% can be refined and standardized into requirements and even granted values [5]. If refined requirements get effectively prioritized in service stakeholders’ perspective, they can be used as very useful information for decision-making.

![Diagram 1: Process of prioritizing requirements in service stakeholders’ perspective.](image)

Fig. 1 shows a process of prioritizing requirements in service stakeholders’ perspective. Refined requirements become prioritized through 4 different stages. The first one proposes the priority of requirements by the frequency of end-users’ opinions. The second one proposes the attribute of requirements and the priority of requirements in business perspective. The third one confirms the priority of requirements by the perspective of service operation and maintenance.

Lastly, when all the results from 3 different priority evaluations are combined, a list of requirements prioritized with overall scores can be prepared, further prioritizing requirements effectively and objectively. Besides, it can be efficiently used as support information for a future decision-making process.

However, a process of refining atypical requirements and making them into a list is excluded from this study.

A. Process of Prioritizing Requirements by the Frequency of End-User’s Opinions

Fig. 2 is the first process, which prioritizes requirements by the frequency of end-users’ opinions. Based on the number of valid opinions from the entire users, the rate of opinions for each requirement should be calculated. For instance, if the number of valid opinions from users is 45, and the number of R_01 is 1, the rate of opinions will be 1/45, which is 0.02 at last.

B. Process of Prioritizing Requirements by the Business Attributes of Requirements

Fig. 3 shows the second process, which prioritizes requirements by the business attribute of requirements. Based on the definition [10] of modification of software functions, the business attributes of requirements should be defined as modification, application, improvement and prevention. Based on the business attributes of requirements, the weighted value of requirement influence is given 4 points for modification, 3 points for application, 2 points for improvement and 1 point for prevention.

For instance, if the attribute of Requirement R01 is modification, the weighted value will be given 4 points, and if the sum of entire requirement attributes is 36, the rate of requirement attributes will be 0.11.

C. Process of Prioritizing Requirements in Perspective of Influence on Service Management and Maintenance

Fig. 4 is the third process, which prioritizes requirements in perspective of service management and maintenance. The software architecture of a service system for research cases in this study is composed of J2EE Layer Architecture [11] and MVC Pattern [12], and it was defined on the basis of influence on management and maintenance of a software platform. Presentation Layer was divided into 3 different
parts, Model, View and Controller of MYC Model.

Fig. 4. Process of prioritizing requirements by the influence of service architecture.

For example, when the administrator evaluates software in service to deal with Requirement R01, it is expected to modify the screen and database, he should mark a check on such items as View, Controller and Integration, and the highest influence part should be given 5 points, while the lowest one should be given 1 point on a scale of 1 to 5. When it comes to calculating the influence rate of R01 on the software platform, if the sum of all the weighted values is 274, the sum of weighted values of R01 is 4. the influence of R01 on the maintenance and management of a service platform will be 4.27, which is 0.15.

D. Process of Prioritizing Requirements with Composite Scores

For an integrated evaluation, it is needed to combine all the 3 values into an integrated score. In other words, the overall score of requirements can be calculated by summing up the rate of opinion frequency, the rate of business attributes of requirements and the rate of influence on the maintenance and management of a service platform.

Table I is a table of integrated scores for each requirement. For instance, if the rate of opinion frequency of R01 is 0.02, the rate of requirement attributes is 0.11 and the rate of influence on the software platform is 0.15, 0.13 will be given as an integrated score.

IV. CASE STUDY

In Chapter III, a case study on ‘I’ Company’s App was conducted to verify the validity and effectiveness of processes and techniques of prioritizing requirement in service stakeholders’ perspective. Besides, the techniques proposed by this study were compared with the existing techniques through the results of the case study, and by collecting opinions from the related workers, this study confirmed that the proposed processes and techniques are more advanced, compared to ones from previous researches.

TABLE II: A LIST OF REQUIREMENTS FOR DECISION-MAKING OF ‘I’ APP

<table>
<thead>
<tr>
<th>R_ID</th>
<th>Rate of Opinion Frequency</th>
<th>Rate of Business Attribute of Requirements</th>
<th>Rate of Influence on Maintenance and Management of a Service Platform</th>
<th>Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>R01</td>
<td>0.01</td>
<td>0.08</td>
<td>0.04</td>
<td>0.13</td>
</tr>
<tr>
<td>R02</td>
<td>0.04</td>
<td>0.04</td>
<td>0.06</td>
<td>0.14</td>
</tr>
<tr>
<td>R03</td>
<td>0.01</td>
<td>0.04</td>
<td>0.06</td>
<td>0.11</td>
</tr>
<tr>
<td>R04</td>
<td>0.17</td>
<td>0.04</td>
<td>0.06</td>
<td>0.27</td>
</tr>
<tr>
<td>R05</td>
<td>0.03</td>
<td>0.08</td>
<td>0.07</td>
<td>0.18</td>
</tr>
<tr>
<td>R06</td>
<td>0.03</td>
<td>0.08</td>
<td>0.03</td>
<td>0.14</td>
</tr>
<tr>
<td>R07</td>
<td>0.11</td>
<td>0.02</td>
<td>0.05</td>
<td>0.18</td>
</tr>
<tr>
<td>R08</td>
<td>0.01</td>
<td>0.08</td>
<td>0.06</td>
<td>0.15</td>
</tr>
<tr>
<td>R09</td>
<td>0.03</td>
<td>0.08</td>
<td>0.06</td>
<td>0.17</td>
</tr>
<tr>
<td>R10</td>
<td>0.03</td>
<td>0.04</td>
<td>0.06</td>
<td>0.13</td>
</tr>
<tr>
<td>R11</td>
<td>0.01</td>
<td>0.04</td>
<td>0.06</td>
<td>0.11</td>
</tr>
<tr>
<td>R12</td>
<td>0.01</td>
<td>0.04</td>
<td>0.06</td>
<td>0.11</td>
</tr>
<tr>
<td>R13</td>
<td>0.11</td>
<td>0.02</td>
<td>0.06</td>
<td>0.19</td>
</tr>
<tr>
<td>R14</td>
<td>0.04</td>
<td>0.08</td>
<td>0.06</td>
<td>0.18</td>
</tr>
<tr>
<td>R15</td>
<td>0.25</td>
<td>0.02</td>
<td>0.06</td>
<td>0.33</td>
</tr>
<tr>
<td>R16</td>
<td>0.01</td>
<td>0.08</td>
<td>0.06</td>
<td>0.15</td>
</tr>
<tr>
<td>R17</td>
<td>0.01</td>
<td>0.06</td>
<td>0.07</td>
<td>0.14</td>
</tr>
<tr>
<td>R18</td>
<td>0.07</td>
<td>0.04</td>
<td>0.00</td>
<td>0.11</td>
</tr>
</tbody>
</table>

After ‘I’ Company's App was modified, this study could extract 72 valid requirements, except for inappropriate 118
requirements, out of all the 223 opinions from users. Based on these requirements, this study defined 18 standardized requirements at last. Table II shows a list of requirements for decision-making prepared on the basis of processes and techniques in Chapter III.

Fig. 5 shows a diagram of integrated scores for requirements prepared on the basis of overall scores. Based on these integrated scores, this study found out a table effectively used for decision-making.

V. CONCLUSION AND FUTURE WORK

This study proposed processes and techniques to prioritize requirements extracted from users' comments in order to develop requirements for the improvement of on-line services. For the development of requirements in service stakeholders' perspective, previous researches were mostly conducted on the extraction and refinement of opinions, but this study is a research on processes and techniques to prioritize requirements, and it was found the related employees showed a high degree of satisfaction of the results of prioritizing requirements through the processes and techniques proposed by this study.

If a list of requirements is prepared with factors of maintenance & repair and management & administration subdivided and stakeholders diversified, in consideration of on-line service providers' circumstances, it will be greatly helpful for a more accurate decision-making process. Besides, when the value of requirements is granted in absolute expense perspective, rather than relative proportion, it will be also helpful for a more effective decision-making process. Therefore, further studies should be carried out on these sections.

REFERENCES


Dong Seok Oh received the B.E degree in computer engineering from Kwangwoon University, Seoul, Korea, in 1999 and the M.E degree in Software Engineering from Graduate School of Information Science in Soongsil University, Seoul, Korea, in 2007. He is Ph.D Candidate at Soongsil University, Seoul, Korea. He is working as a IT projects’ quality manager at OPEN-SNS, Korea. His current research interests include Project/Software Quality Management, Project Management Office, IT Project Requirement Engineering, IT Project Architecture, IT Project Engineering and related Tools.

Hye Young Jeon received the B.E degree in computer science from Sihwa University, Kyung-gi do, Korea, in 2005 and the M.E degree in Software Engineering from Graduate School of Information Science in Soongsil University, Seoul, Korea, in 2008. She is Ph.D Candidate at Soongsil University, Seoul, Korea. She is working as a IT consultant and SW Education Expert. Her current research interests include Software Requirement Engineering, UX Engineering and Consulting, SW Engineering Education.

Sung Yul Rhew received Ph.D degrees in computer science from Ajou University and the MS degrees in computer science from Yonsei University, Seoul, Korea, in 1996 and 1980, respectively. He is working as a professor of software engineering in school of computer science and engineering at the Soongsil University. His research interests include Software Requirement Engineering, Software Maintenance, Open Source Software.