

VoVo: A Hybrid Requirements Prioritization Technique in Scrum-Agile Environment

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Article Info

Volume 81

Page Number: 3101- 3107

Publication Issue:

November-December 2019

Abstract:

Requirements prioritization is a crucial process in Requirements Engineering. However, selecting an appropriate technique in Scrum-Agile environment which can satisfy a quality factor such as scalability, effectiveness and efficiency can be difficult. Moreover, it becomes much more difficult if the stakeholders are distributed in different places and most of stakeholders tend to neglect this activity. This paper will proposed VoVo technique, a hybrid requirements prioritization technique which combined cumulative voting and Volere techniques. VoVo offers a structurally guided prioritization technique which can encourage user participation in prioritization process and also can mitigating the scalability issues especially in geographically distributed project. This hybrid technique is using two tiers prioritization process where in the first tier, the prioritization will be done by stakeholders while in the second tier requirements will be prioritized by an experts usually a scrum master or project manager. The implemented VoVo has been evaluated through evaluation survey which addressed directly to scrum practitioners. Its suitability and effectiveness in managing and prioritizing requirements in Sprint Backlog will be measured based on testing and evaluation survey feedbacks. Hence, we conclude that VoVo technique is suitable to be used for managing and prioritizing requirements in Scrum project.

Article History

Article Received: 5 March 2019

Revised: 18 May 2019

Accepted: 24 September 2019

Publication: 14 December 2019

Keywords: requirements prioritization, prioritization technique, requirementsanalysis, Scrum-Agile

1. INTRODUCTION

In the last few decades, IT researchers had tried to investigate the cause of software project failure and they had identified that one of the causes is related to the Requirements Engineering (RE) process. RE can be defined as a collection of methods and techniques used to determine stakeholder's expectations and needs for the new or upgraded software product. It also fully aware of different features and limitation of the software to-be developed (Batool et al, 2013). RE can enhance the software development process by providing the best choice of alternatives which can satisfy the multiple goals required by multiple stakeholders (Abou-Elseoud, Nasr &Hefny, 2016). Previous researchers also had acknowledged that RE process is a core process in the software

development that emerge throughout the development phases. It can effects the product's quality, production cost, development duration and risk if not being implemented correctly and also can causes the delivered product did not meet the requirements or satisfy the customer's needs.

The requirements prioritization, in other hand, is a technique used by software developer to determine the sequence of requirements to be implemented in order to meet the needs of stakeholders. Besides that, it also being used to resolve conflict between stakeholders, and to identify the major requirements which can affect the project success. All the stakeholders (customers, developers, sponsors, etc.) should participate in this process so that, they can

compromise about the product release and to avoid the missing requirements during the development process.

In scrum-agile, requirements prioritization is crucial in order to determine the product release for every sprint. In other words, this process helps the developer to determine which requirements to be implemented in early stage or which requirements can be delayed for later stages especially when there are limitation such as time constraint, and limited project's resources. In those situations, it is impossible to implement all the requirements requested by the stakeholders. Sometime developer do not know which requirements are most important to customers and which can give a huge impact to their business value. Besides, there are also few customers who are too ambitious about product requirements in order to achieve their business objective without considering other development issues such as project resources and technical issues. They also cannot make a wise decision due those constraints associated with the certain requirements. Therefore, using an appropriate technique of requirements prioritization is crucial in software development process especially in scrum-agile environment with distributed stakeholders.

This paper will discuss our proposed technique called, VoVo which is a hybrid requirements prioritization technique by integrating the qualitative and quantitative prioritization technique in order to overcome

the scalability. We also verified the suitability and effectiveness of VoVo technique by embedding it in the Scrum Task Management (STM) tool and evaluated by scrum-agile practitioners. The rest of the paper is organised as follows: Section 2 presents the methodology of the work, while Section 3 discussed the proposed technique, ViVo. Evaluation and analysis of the proposed technique is discussed in Section 4. Finally, Section 5 draws the conclusion of this study.

2. METHODOLOGY

In literature we found that the existing prioritization techniques only focus on the certain development parts and most of them are neglecting the stakeholder's perspective in every constraints as shown in Table 1 while Table 2 shows the focus and limitation of the hybrid requirements prioritization techniques proposed by previous researchers.

Hence, we had conducted a requirements analysis by doing comprehensive literature review and content analysis of the existing research works in order to determine the best solution for the research problem and future area of studies. Then, VoVo was being proposed. In order to illustrate the effectiveness of the VoVo technique in prioritizing, scheduling and distributing tasks (requirements) in scrum-agile project, a Scrum Task Management (STM) tool was developed and VoVo technique is embedded into it.

Table 1. The comparison of existing prioritization techniques

Technique	Scalability	Support Client Participation	Support Huge Requirements (>50) Prioritization
Round-the-group prioritization (Berteig, 2006)	No	No	No
Ping pong (Berteig, 2006; Berry & Franch, 2011)	No	No	No
100 Dollar / Cumulative Voting (Straker, & Rawlinson, 2011; Chatzipetrou, Angelis, Rovegard, & Wohlin, 2010)	No	Yes	Yes
Multi voting (Berteig, 2006)	No	NI	Yes
Pair wise analysis (Chen et al. 2013)	No	No	No

Dot voting (Bebensee et al. 2010)	No	Yes	NI
Analytic Hierarchy Process (AHP) (Handfield, Walton, Sroufe, & Melnyk, 2002).	No	Yes	NI
Volere (2018)	Yes	Yes	Yes
Weiger's matrix (Berteig, 2006; Berry & Franch, 2011)	Yes	Yes	Yes
QFD Quality functional deployment (QFD) (Racheva, Daneva&Buglione, 2008)	No	Yes	NI
Moscow (Racheva, Daneva&Buglione, 2008)	Yes	Yes	NI

* NI = Not Indicated

Table 2. Few examples of hybrid requirements prioritization techniques

Proposed Technique	Focus	Limitation
Enhance Hybrid Requirements Prioritization (EHRP) (Abou-Elseoud, Nasr, and Hefny, 2016)	- To overcome the scalability, complexity and preference matrix problems.	- Focus only on ranking the relative requirements in the third level prioritization process without proper guidelines how to achieve the goal mentioned in the first level. - Its implication in scrum-agile environment has not been mentioned
Hierarchical Cumulative Voting (HCV) (Santos, Albuquerque, &Pinheiro, 2016)	- Minimizing the scalability problem. - To elicit and prioritize the requirements of project where the stakeholders are geographically distributed.	- Cannot be implemented if the amount of requirements is large where the comparison process will be complicated. - Its implication in scrum-agile environment has not been mentioned
An Interactive Approach to Requirements Prioritization Using Quality Factors. (Singh, &Jatani, 2013)	- Focus on prioritizing the quality attributes.	- Its implication in scrum-agile environment has not been mentioned

The tool has undergone two categories of testing process. First is the internal testing where the tool functionalities have been tested during the development process. Second is functionalities testing by selecting external testers who had at least one year experience in Scrum-Agile project after all development processes are completed. After then, we did evaluation on the tool by giving a survey to the external tester to evaluate its suitability and effectiveness in prioritizing and scheduling the requirements. The testing result will be used to conclude the research outcomes

3. THE PROPOSED TECHNIQUE: VoVo

The VoVo technique was designed by combining two existing prioritization techniques, Cumulative Voting and Volere technique. This hybrid requirements prioritization is also known as two tiers prioritization which using Ranking Method, Comparative Method, and Scoring Method (weighted average).

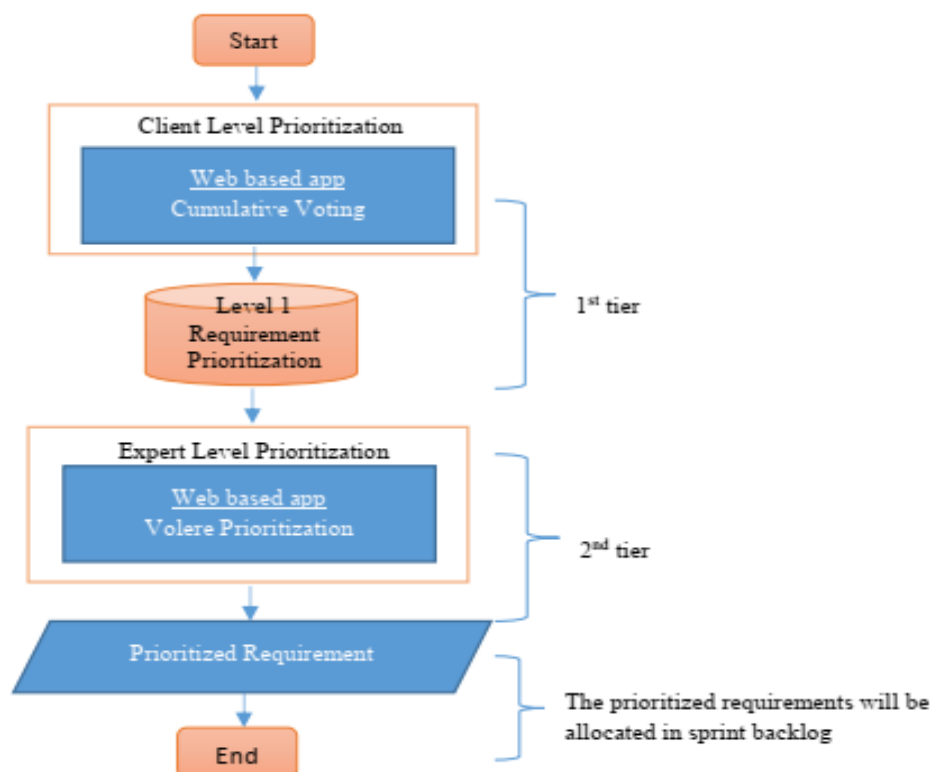


Figure 1. The basic procedure of VoVo

Figure 1 shows the basic flow of the VoVo technique which divided into two tiers prioritization process. In the first tier, the prioritization will be done at client's level by using cumulative voting. Through this technique, it is possible to add the judgement of a lot of clients. They also can consider the importance of each requirements based on their perspective. The cumulative voting technique is easy to understand and result will be shown in numerical format. The 100 points will be given to each stakeholders and they must allocate all of the points to requirements listed in product backlog. The average points for each requirements will be calculated using formula:

$$\text{average point} =$$

$$\frac{\text{total point allocated by all stake holders}}{\text{number of stake holder}} \times 10\% \quad [1]$$

In order to carry forward a standard weighted value with the other criteria in second tier where;

prioritization, the average point will be multiplied with 10% constant.

In second tier prioritization process, the requirements will be prioritized by using Volere technique. In this level, the prioritization process will be done by an expert, a person who is responsible to arrange requirements in sprint backlog, usually a Project Manager or Scrum Master. The average point calculated in the first level will be carried forward as score for 'Value to Customer' in this level. The percent weight is the agreed percentage importance of a factor. The total percentage weights for all factors must be 100%. The score for each factor is out of 10 points. The score is assigned based on the how much of a positive contribution that requirements makes to the particular factor. The final priority rating will be calculated by using formula:

$$\text{Priority Rating} = [(aw) + (bx) + (cy) + (dz)] \quad [2]$$

a = Value to Customer

w = Weight applied to Value to Customer

b = Value to Business

x = Weight applied to Value to Business

c = Minimize Implementation Cost

y = Weight applied to Minimize Implementation Cost

d = Ease of Implementation

z = Weight applied to Ease of Implementation

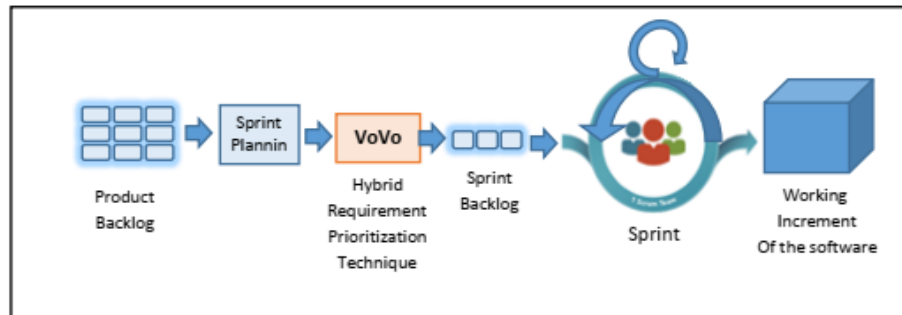


Figure 2. The Framework of the Scrum-Task Management Tool Embedded with VoVo Technique

Figure 2 shows how VoVo technique been embedded in STM tool. The task management process begin when, scrum master/project manager start review the requirements in the product backlog. Ideally, the product backlog should be a list of every product related task scrum team needs to complete within a defined time-frame. The requirements in the product backlog will be prioritized using VoVo technique during Sprint planning. This prioritization process is crucial in order to avoid the scrum team been stuck in a Sprint planning,

4. RESULTS AND DISCUSSION

STM tool and VoVo technique evaluation is performed through a survey study. The evaluation survey were distributed to Scrum-Agile practitioners through email and instant messaging application (WhatsApp). Total number of respondents is 10 which 50% have 4-7 years of working experience in Scrum project, while 40% have 1-3 years working experience and 10% have 8-14 years working experience. The majority of the respondents work as programmer (60%) followed by 20% works as System Analyst, and only 10% works as Project Manager and Business Analyst.

Based on the evaluation results, the suitability of VoVo technique is calculated at

where everyone has a different view of which requirements should be implemented first in Sprint. According to Rule of Thumb, 5 to 15 requirements per Sprint is about right and 20 requirements is an upper limit. In order to select these 5-15 requirements, a prioritization process is a best choice. By embedding VoVo prioritization technique, the requirements in product backlog will be prioritized and then requirements with high priority rate will be selected to be listed in the sprint backlog.

85% which based on evaluation survey rating using the following formula:

$$\text{Suitability} = \frac{\sum(\text{Very Good} + \text{Good})}{\text{Total points for all suitability questions}} \quad [3]$$

Remaining 15% are considered neutral or moderate. Table 3 shows the summary of suitability of VoVo technique and STM tool for prioritizing and managing requirements in Scrum. Furthermore, all 10 respondents agreed that VoVo technique is suitable to be practiced in Scrum project which is can increase the customer participation in requirements prioritization process and also can increases the quality of requirements management in Sprint.

Table 3. The summary result of VoVo technique and STM tool

Question	Very Good	Good	Moderate	Poor	Very Poor
Is STM tool and VoVo technique is suitable to manage task (requirements) in Sprint?	40	50	10	-	-
How well does STM tool and VoVo Technique support requirements prioritization process?	40	50	10	-	-
How well does STM tool and VoVo Technique support customer participation in task(requirements) arrangement in Sprint?	40	50	10	-	-
Does the STM tool and VoVo technique can reduce the Sprint Freeze?					
Does the STM tool and VoVo technique allows you to maximize the value delivered in Sprint?	20	40	40	-	-
Does the STM tool and VoVo technique improves the quality of task (requirements) management in Sprint?	40	40	20	-	-
Does the prioritization result displayed in STM is easy to understand?	50	40	10	-	-
Do you think STM tool and VoVo technique can be used in distributed project?	30	60	10	-	-

5. CONCLUSION

There are various requirements prioritization techniques in literature and practice, but no significant comparative evaluation of these techniques has been made so far. VoVo technique focuses on enhancing the management task in scrum-agile development. Based on evaluation survey, VoVo technique suitable to be used in STM tool and can increase user engagement in software development process especially during requirements prioritization.

As a future work, expanding the case study for other software development which may focus on new aspects such as estimation of different software quality like estimation of effort, availability of resources and etc. The most important next step is to propose an appropriate guideline where can avoid stakeholders manipulates the voting value in order to accomplish their won objectives.

6. ACKNOWLEDGMENT

The authors would like to express appreciation for the support of Universiti Putra Malaysia through Geran Putra, Cost Centre: 9596600.

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