CRITERIA FOR ACCEPTING SOFTWARE REQUIREMENTS NEGOTIATION TOOLS IN THE SOFTWARE INDUSTRY

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ABSTRACT

Requirements negotiation is a centralized process of making a decision in order to resolve conflicts in the requirements of the stakeholder. The negotiation will enable the shared vision of software to be developed among the heterogeneous stakeholder in the software industry to be achieved. Many process models used for the negotiation of stakeholder’s requirements have been proposed for the software industry by the research community, yet the acceptance of these process models is discouraging. This study tends to investigate the inadequate adoption of requirements negotiation process models. Further, it finds the acceptance criteria for the software industry to adopt requirements negotiation models. Finding shows that the software industries do not adopt the process models. The perceived usefulness, perceived ease of use and many more criteria have been identified through the literature review on the general criteria of software systems acceptance.

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INTRODUCTION

Requirements negotiation is a centralized process of making a decision in order to resolve conflicts in the requirements of the stakeholder. The negotiation will enables the shared vision of software to be developed among the heterogeneous stakeholder in the software industry to be achieved.(1). In software engineering, conflicts play a significant role although they are badly handled or often neglected by existing methods of software development. The occurrence of conflicts increases as stakeholders such as developers, acquirers, users, and maintainers pursue mismatching goals(2). The result of negotiation is set to satisfies two or more
negotiation participants in the presence of limited common knowledge and conflicting preferences (3, 4). Many software projects have failed due to poor requirements negotiation among stakeholders (5). The automated negotiation tools proposed to the software industry for requirements negotiation include win-win easywin-win, MPARN and so on (4). Although numerous advanced researches exist in requirement negotiation that had been proven to enable software development industries carry out a structured requirement negotiation, yet the acceptance from the software industries is discouraging. To our knowledge there is no studies that investigate the cause of the rejecting of these tools and acceptance criteria for software industries. Moreover, considering the importance of requirements negotiation models proposed by the academician to software industries, this research sought to investigate the reason for the rejection of requirements negotiation solutions and identify criteria for the software industries to accept requirements negotiation tools. Finding shows that acceptance of automated tool of requirements negotiation is poor. Consequently, there exist many criteria for the software industry to accept requirements negotiation system

**RESEARCH METHODOLOGY**

This section presents the methodology adopted in this research. The guidelines of the study are depicted in Fig. 1.

**PLANNING**

In this section, the authors initiate the research process by structuring the scope including the research questions, a survey with the participants from the software industry and analysis on the general criteria which make the user accept the software system. The criteria of software acceptance were recommended in the requirements negotiation for the software industries. This section originates the foundation of the methodology in this research.
RESEARCH QUESTION

The research questions (RQs) are formulated based on the motivation for addressing the study research objective. Table 1 listed the RQs along with their respective justifications.

Table 1: Research Questions and their rationale

| RQs | Research Question | Rationale |
|-----|-------------------|-----------|
| RQ1 | Do software industries adopt requirements negotiation tools to achieve agreements between the stakeholders? | To identify whether the software industries are adopting requirements negotiation tools |
| RQ2 | What are their criteria of accepting requirement negotiation tool in the software industry? | To investigate the criteria for software industries to accept requirements negotiation tools. |
**Survey on Software Industries**

This study survey 22 stakeholders from the software industry. These stakeholders are selected randomly so as to ensure proper representation of all stakeholders. Hence, stakeholders in the industry have equal chances of being selected to participate in the survey. The google form of the survey was sent online to the participants from the companies selected to participate in this research. The companies involved in the survey include software development Industries that specialize in the development of software systems, IT Development companies which provide the software development inside the organizations and IT consulting companies that provide guidance services to other IT companies.

**Review on the Criteria of System Acceptance**

In an initiative to get the software industries to accept the requirements negotiation tool, this research performs a literature review on the criteria which influence users to accept software systems. The search string was formulated and manipulated on the electronic databases which include Google scholar, Science direct, Scopus, and dimension. Literature search results show many studies which adopts criteria in order to make users accept the software system.

The research findings from the literature indicate that many factors influence the decision of the users when they are presented with a new software package (6). These factors are subjective norms, attitude and perceived behavioral control.

*Subject Norms:*

Is described as perceived social pressure to perform or not to perform the behavior in question(7). Person’s perception is on people who are important to him, and the decision that he should or should not perform the behavior in question depend on the people.

*Perceived Behavior Control:*

Defined as an individual’s perception of the ease or difficulty of performing the particular behavior(8). On software system, it refers to the situation when a user considers the using a software system as easy or otherwise.

*Attitude:*

The degree to which a person likes or dislikes the object. In another definition, an attitude refers to a set of emotions, beliefs, and behaviors toward object, person, thing, or event.

**Result and Discussion**

This section presents the results and discussion of the RQs describe in Table 1.
RQ1: DO SOFTWARE INDUSTRIES ADOPT REQUIREMENTS NEGOTIATION TOOLS TO ACHIEVE AGREEMENTS BETWEEN THE STAKEHOLDERS?

This RQ investigates the perception of the stakeholders regarding the adoption of requirements negotiation tools in their industries. The finding shows that from 22 respondents, 91% (20) participants stated that they negotiate requirements manually as presented in Fig. 2. However, 9% (2) respondents used automated requirements negotiation tools in their industries.

The reasons for not adopting the automated tools as stated by the majority of participants is as follows:

1. The tools are expensive for industries to acquire,
2. Tools are not available in the market for the software industries to acquire.
3. Some of the participants clearly explained that the customer prefers the manual negotiation of the agreement because they want to be involved in all the software development process.
4. Selected option of the stakeholders is often not be the right option for the decision-makers in the software industry.

![Mode of Negotiation in the Software Industry](image)

Fig. 2: Mode of Negotiation in the Software Industry

RQ2: WHAT ARE THEIR CRITERIA FOR ACCEPTING REQUIREMENT NEGOTIATION TOOL IN THE SOFTWARE INDUSTRY?

The general criteria for accepting a software system are suggested by this study be strictly adhere to while proposing the requirements negotiation tools to the software industries for the tools to be accepted. The factors that determine the software acceptance by the user earlier explained contain many criteria that can be adopted in the requirement negotiation research domain. The factors that determine the software acceptance composed of many criteria. Some of the existing criteria a described below:

Perceived Usefulness:

This is the degree to which an individual believes that using a system would improve his/her performance. In the software industry, one of the reasons for not adopting the tools is because end-user of a software project prefers to be involved in every stage of...
software development. The full implementation perceived usefulness criteria will motivate the user to use an automated negotiation system because it will improve performance.

**Perceived ease of use:**

This is the degree to which an individual believes that using a system would be free of physical and mental effort. Users of the software should learn that using an automated tool while negotiation requirements will ease the process and resolve the conflict which may arise due to mismatching goals of the stakeholders. This research suggested that perceived ease of use criteria should be adopted while formulating and developing the requirements negotiation tools.

**Perceived Risk:**

Refers to the stakeholder’s perception of the risks associated with any purchase and is mostly associated with products that are expensive. The participants stated tools are expensive for industries to acquire, so adoption of perceived risk criteria while proposing the requirements negotiation tool would address the issue and make acceptable for the software industry.

**Compatibility:**

The degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters (9). Stakeholders stated that the tools developed lacked the capability of negotiating the complex requirements of the software industry. This is due to the non-adoption of compatibility criteria in the existing requirements negotiation tools. The incorporation of the compatibility criteria in requirements negotiation tools will make the stakeholders consistently accept the tools in the conduct of negotiation.

**Interpersonal Influence:**

Is a form of subjective norm were individual behavior is influenced to perform or not to perform the perceived behavior by a person or group (10). Stakeholders that participate in the survey stated that one of the reasons for not adopting the requirements negotiation tools in the industry is because the ‘voted option by all stakeholders may not be the right option for the decision-makers’ according many of the participants. However, applying this criterion is appropriate to makes other accept the tools. The interpersonal influence will allow those stakeholders who disagree with the voted option by all the stakeholders to re-negotiate the decision by requesting some justification from the stakeholders.

**External Influence:**

Various external factors can impact the ability of a stakeholders to achieve their strategic goals and objectives. In the software industry, external stakeholders can be invited to encourage other stakeholders to use a requirements negotiation tool.
**Facilitating Condition:**

Refers to the extent to which an individual perceives that technical and organizational infrastructure required to use intended system are available. The requirements negotiation tools should contain the technical infrastructure to enables the stakeholders in the software industry to perceive that all the facilitating condition are available in the tool. The adoption of this criteria would improve the acceptance of the tools in the software industry.

**Satisfaction:**

Is the degree to which an individual believes that using a system will help to achieve an expected performance. Requirements negotiation should possess the necessary feature that will enable the stakeholders in software industry reached by degree of satisfaction.

**KEY FINDINGS**

- Finding shows that the software industries have not been adopting requirements negotiation tools despite the large number proposed by the researchers. The project sponsors voluntarily failed to adopt requirements negotiation tools because they want to be in each stage of the software development process.

- According the survey result with the stakeholders in the software industry, there is unavailability of the requirements negotiation tools in the market for the software industries to acquire. However, the limited tools available in the market are too expensive for the software industries to purchased.

- Results from the survey in the software industry indicates that requirements negotiation tools are rejected by the industry due to mismatching opinion between the decision-makers and stakeholders.

- Review of existing work proves the existence of many criteria which may influenced the software industries accept requirements negotiation tools. Although some of the criteria are in one way or other adopted in some of the requirements negotiation studies, finding shows that many of the criteria are not in the requirements negotiation tools.

- Interpersonal influence criteria in the requirements negotiation tools will make the top management accept the tools. The tools are rejected by the top managements in the organization. The interpersonal influence criteria enable the top management to dictate the requirements negotiation decision when they are not satisfied with the decisions taking by the majority of the stakeholders in the software industry.
CONCLUSION

Requirement negotiation tools enable stakeholders to elicit requirements, identify issues, options, and reached agreement on the requirements of the software projects in the industry. The comprehensive negotiation tools have been proposed which are believed to promote structured negotiation among the geographically distributed stakeholders and allow modification in the negotiated requirements to accommodate changes in the decision of the stakeholders. However, the acceptance of these tools in the software industry is poor. This research investigates the reasons for the rejection of the tools and determine the acceptance criteria of the tools in the software industry. The study finding shows the existence of many criteria whose if fully implemented in the requirements negotiation, the rate of acceptance from the software industry would improve. The criteria include the perceived easy, perceived usefulness, interpersonal influence and so on.

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