

GTCM Enabled User Involvement in eXtreme Programming Approach

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Abstract

User involvement has been shown to be beneficial in eXtreme Programming projects. However, it has been a challenging issue in terms of engaging the right target of as onsite-customers. Despite researchers' efforts to improve the quality of user involvement in eXtreme Programming projects, user involvement gaps are still shown to be demanding a solution. We conducted literature and assessment-based study of the current practices of GTCM (Goal Target Channel Message) Concept and user involvement in eXtreme Programming and demonstrated the proposition of new approach and evaluations. The result of the research is an approach for the GTCM enabled user involvement in eXtreme Programming for the selection of appropriate users to participate in software development projects. The study used a design science research approach triangulated with qualitative and quantitative assessments and evaluations through action research and expert opinion to address the research objectives.

This paper proposes a new approach to improve the quality of user involvement in eXtreme Programming projects by using the GTCM Concept for the selection of users to participate in projects. The approach is evaluated in two iterations of project-based action research study and expert evaluation. The results show that the approach improved the quality of user involvement as well as user satisfaction. It is envisaged that the results of the research can be applied in any eXtreme Programming project to achieve the quality of user involvement.

Keywords: User Involvement; Agile Development; GTCM; eXtreme Programming; Software Engineering

1. Introduction

Today, software is eating the world [1]. There are no technical or organizational processes and services that are not related to software systems. The communication and lifestyle of people depend to a large extent on software systems. The security and critical infrastructure of nations depend on software and software engineering practices play a large role in the industry. The largest and most successful companies around the world are now software companies.

Software engineering has always suffered from fashions. Each decade in the past years had its own technology fashions including the disciplines and practices of software engineering. But as always, the truth is never in just one approach. The old saying “there is no silver bullet” [2] is still valid again so in fact, the agile approach is also not the silver bullet.

However, 78% of organizations practice Agile approaches [3] and the number is growing every year. One of the most widely used approaches of agile philosophy in the software engineering industry today is the eXtreme Programming approach. Sixty four percent of organizations use it with the adoption of other approaches [3].

In practice, one of the signs for the best quality of a software product is users' satisfaction [4] and improvement in user satisfaction has direct correlation with the quality of user involvement in the project [5]. Half of the software projects are successful due to their 52% focus on user satisfaction. Basically, satisfaction of users can also be used as one of the measurement aspects for software projects' success [3]. It is proved that user involvement positively affects user satisfaction [6, 7] and many researchers have investigated a way to increase user involvement in agile and also in eXtreme Programming approach.

In organizations working with people as their market engine, the participation of people is a critical strategy for organizational success. Such organizations realize a 50% higher productivity [8]. GTCM Concept has been implemented in various projects as a key ingredient for such success and can be used in activities involving people and can be implemented for various software engineering projects.

The motivation for this research is the existing challenges in achieving quality software in the eyes of user involvement in eXtreme Programming. There is a huge gap of user involvement in eXtreme Programming. Despite efforts of researches in implementing different approaches for efficient user involvement in eXtreme Programming projects, the participation of inappropriate users has been a challenge [9], negatively affecting a project's overall success. Because of these challenges, there is a need for enhancing user involvement practices in the eXtreme Programming approach.

This study has two major research questions to answer: What are the challenges of user involvement in the eXtreme Programming approach? How can the GTCM Concept address user involvement in an eXtreme Programming approach?

This study used Peffer's design science research approach [16] triangulated with Action research and expert opinion techniques gearing qualitative and quantitative methodologies for data collection and analysis. The research was conducted in three phases namely: current practice assessment, application of the approach, and expert evaluation.

2. Related Work

The authors in [10] presented a theoretical study focusing on the comparison of RUP and eXtreme Programming features. It discussed and compared the activities of both methodologies during phases of a primary investigation, analysis, design, implementation, and transition phases. It is claimed that the proposed model is more efficient than eXtreme Programming and RUP exploits human experience during software development without any practical case study. Such claims need to be evaluated by different model evaluation techniques and also through feedback from the industry.

A novel process model SPRUP was proposed by integrating eXtreme Programming, Scrum and RUP and was validated through a controlled case study in [11]. It was claimed that the integrated model will be efficient, effective and fulfills the needs of business requirements. But the authors did not conduct a comparison of the proposed model with other process models or at least evaluated through case studies because the usability and effectiveness cannot be measured without comparison and empirical evaluation in which, and according to [12], the evaluation is supposed to describe how closely it scores on a test corresponds (correlates) with behavior as measured in other contexts.

Technical reports [13] show that GTCM adopted the 4 Disciplines of Execution model (4DX) to plan the digital marketing section and aimed to increase the project goals and they conducted an evaluation of the section growth which indicated the achievements the organization made on its programs against the year before and they scored 482.72% and 150% growth in two of their goals.

The authors in [14] tried to investigate the challenges that emerge during user involvement in eXtreme Programming, analyze and propose a solution. The work addressed the benefits of involving users and the problems that may drag the project into failure. The authors attempted to investigate the challenge that the projects have experienced from users who are not active and available, part-time users, lack of communications, change in requirements, and indicated the possible solution. The authors suggested Product Management Team to act as a user during requirement elicitation. The finding did not indicate any scientific methodology that will support the technical team to identify the most appropriate users to participate in the technical team that can replace part-time users by fulltime. According to [15], a technical team is not recommended to take part and influence the requirement elicitation process during system development. It will be a cause in terms of creating favoritism towards the needs of the technical team.

3. Current Practice Assessment Findings

Results from this survey suggest that GTCM Concept practices in the offices are inclined in three

major areas: project campaigns and promotions, selection and recruitment, and ICT.

Evaluation on participants' profiling and their exposure to projects [Figure 1] shows that the majority of the participants (76.9%) are exposed to marketing portfolios and projects, 65.4% to Talent

management portfolios, 61.5% to ICT, 26.9% to exchange project participants, 19.2% to external relations participants, and 15.4% to finance and legalities participants. This exposure can be used as an indication of the experience levels of participants to ensure their appropriateness for the survey.

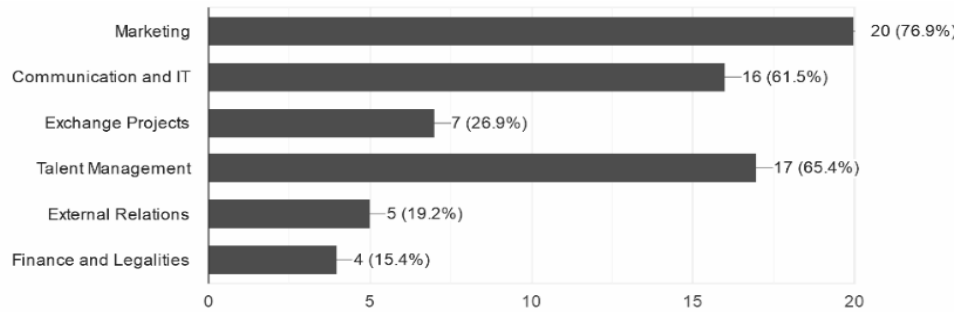


Figure 1: Project Activities GTCM is used for

The participants experienced the GTCM Concept in various portfolios and departments [Figure 2]. The majority (57.7%) of the participants used it for

project campaigns, 53.8% for target user selection, ICT (50%), and recruitment related activities (34.6%).

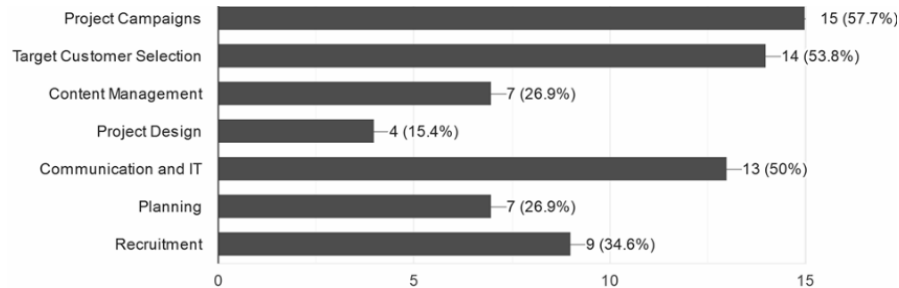


Figure 2: Participants' Exposure

Evaluation of the usefulness of the GTCM Concept, its exposure, and applicability in the IT industry is investigated and based on the experiences of the participants, 76.9% of them believe that the GTCM Concept is very useful and 23.1% think it is fairly useful. The majority (76%) of participants were engaged and exposed to the development of technological solutions using the GTCM Concept.

It has emerged that the GTCM Concept is very useful and can be used as a good practice. Furthermore, the concept can be used in IT projects in practices related to planning, recruitment, branding, product development, communication, and campaigning.

On the other hand, results from the interviews show the current practices of eXtreme Programming experienced a significant challenge during user involvement. The participants mentioned challenges

related to lack of technical knowledge, documented, organized and clearly defined business processes and regulations. All of the participants experienced the involvement of inappropriate users. Unavailability of users, even if they are available they are not actively participating and they also lack the mandates and ability to decide on some of the scenarios and in general their lack of interest in the domain, all extended from the inappropriate selection of participants and also sampling techniques because they also observed employees left out from the selection process.

Other challenges were also mentioned by the participants such as communication gaps observed during team meetings between developers and user participants. Lack of knowledge and interest in the domain is the major cause of communication gaps [17].

Similar perspectives are addressed in [15] with major indications to the limitation factors related to lack of capable and knowledgeable users participating in the development which is mainly caused by the inappropriateness of users for the role. Also, it was mentioned that a communication gap between users and developers is a major challenge during user involvement.

The projects did not use any selection criteria. Instead they select based on their monetary interests, closeness to the departments and their social acceptance. Because of these, they suffered many challenges during the selection processes. The participants mentioned the challenges that are related to weak selection process are due to inconsistent candidate evaluation, struggle when making selection decisions, lack of criteria and role definitions, administrative influence on both selectors and participants by using incentives and administrative powers. According to participants, implementation of new selection practices will have a positive effect on the process and resolve the challenges in terms of selecting the appropriate participants, support for participants' evaluation with common guidelines and methodologies.

4. The Proposed Initial Model

The proposed initial model can be characterized as an iterative approach. The eXtreme Programming process components are not changed during the development of the model, rather a new practice is injected into the planning stage as shown in Figure 3.

The planning phase is the first phase of the life cycle, where the adoption of the GTCM concept is extensively permuted. The project manager begins the cycle by building the plan, time, and costs of carrying out the iterations, and individual developers sign up for iterations. Then s/he develops the GTCM definition for the specific iteration project, the so-called selection procedure. The selection process is the key phase in the project because it is the stage where the backgrounds of the candidate participants are mapped against the goal of the iteration. The GTCM Concept is used as a tool to guide the selection procedure. The concept has four major components: *Goal*, *Target*, *Channel*, and *Message*. In

this case, the concept is used for selection purpose and the main focus of the selection process is to finally deliver a list of individuals as targets. Therefore, the *Target* component of the concept is permuted to the final stage of the GTCM concept processes.

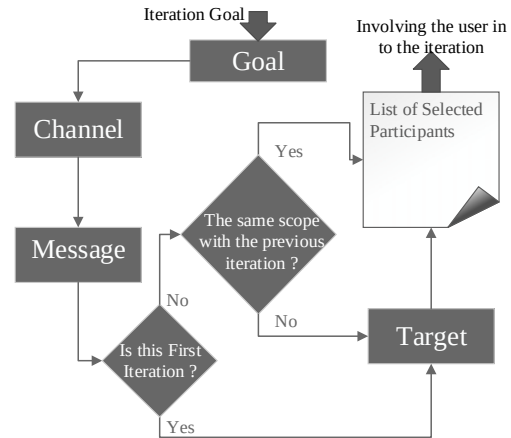


Figure 3: GTCM Process Model

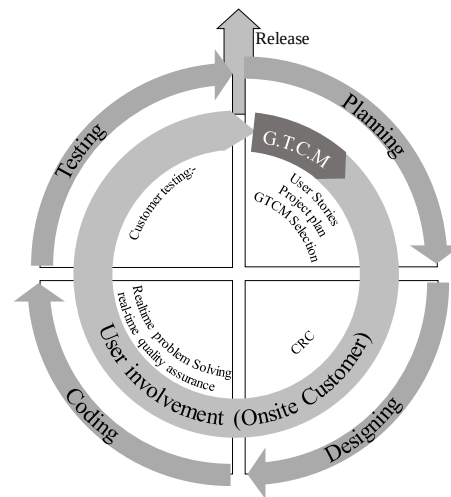


Figure 4: The Proposed Initial Model

The procedure will only guide the project team on the selection of participants for involvement in the project. The adopted selection procedure of the GTCM Concept is shown in Figure 4.

Step 1 - Goal Setting: Selection goals are project goals defined during the project charter with the project manager and stakeholders are directly used for this step. The goal is set for the purpose of letting other components to define their scopes and help the project manager to come up with a variety of criteria as per the need in order to achieve the selection goal.

Step 2 - Setting Channel: Channel is defined as a method and strategy of delivering a project, which will answer the *How* of the project. Software projects have their own ways of implementing projects in terms of project management methodology that the project manager chooses. A technology that is used to develop the system or any organizational standards that is going to affect the involvement of the users are mentioned and listed out at this stage. This level will help the selectors to identify participants based on their technical knowledge and backgrounds.

Step 3 - Setting Message: Message is the content of a project which defines the *What* of the project. Each iteration has its own functionalities and features expected to have at the end. This step details the description of the required high level functionalities of the system. It will help the selector to identify the work domain of the participants.

Step 4 - Target Selection: At this step we already know the *Goal*, the *What* and *How* of the project. Based on the settings, the selector will define the criteria for selecting candidate participants. Criteria are defined separately for each setting and are evaluated based on their predefined weightings by the selector.

The involvement level and range of users will depend on the criteria set in the components. Meaning, the required metaphor, and the definition of users are defined at this stage. *As an example, if the goal of the iteration is to develop a module on financial management activities, the end user will more likely be a finance expert with required experience in such a way that the channel and message are defined in a similar manner to select the best financial expert in the domain.*

Step 5 - Selection: At this step, users' profile is collected and sorted with the required information based on the criteria. Each candidate is evaluated and measured on a percentage scale. The top-scoring candidates are considered as the ideal participants that are going to be involved through the Onsite Customer practice in the selected iteration project.

Selected participants meet the development team to create 'user stories' or requirements. The development team converts user stories to iterations that cover the functionalities or features required for

a single iteration and their combinations at the end provides the customer with the final fully functional product.

5. Application of the Approach

The results of the current practice assessment are used as input for this action research. Along with that, initial contact with the key participants was facilitated. One of the major activities conducted was the preparation of the project proposal of the action research. Secondly, a couple of meetings in the department were steered and raised the purpose and awareness of the research and support for the project. Based on the meetings and previous assessment output, facilitated discussion on the problem situation and intended actions have conversed and finally the current state is analyzed.

Iteration and further problem situations and outcomes are identified. Assessment of the team identified the potential team members to support and implement the proposed model procedures. Based on the number of team members, task identification and mapping were conducted with respect to the team members' roles in the department.

A project is identified based on the department's annual plan. From the selected project, the project team and stakeholders made a list of all the project iterations based on their priorities made by the stakeholders. For this study, two iterations were selected to be included in the action research.

Based on the initial proposed model, implementation of the selected iteration projects is conducted with the application of the procedures and practices of eXtreme Programming. The teams followed the proposed process model at the planning phase. Based on the three components of the GTCM Concept, the team have come up with a list of criteria for the selection and conducted the selection.

Users' profile are collected and sorted with the required criteria information. Each candidate's profile are evaluated by the assigned team members and sent a notification to the project manager. Accordingly, the project manager announced the selected participants to the relevant offices and stakeholders then proceeded to the following phases of the project.

After selection is finalized, the team constructed from both technical and users performed the planned activities and tasks. Since participants are part of the planning, they consider themselves not as users but also contributors to the success of the system. The participants contributed in a way defined by the eXtreme Programming practices and scopes.

The project team conducted an assessment each week and phases of the iteration. Meanwhile, the project result is evaluated using an NPS (Net Promoter Score) score (Table 1) to validate if the challenges and problems are resolved by cross-checking user satisfaction.

Table 1: User Satisfaction Evaluation (NPS)

Metrics	1 st iter	2 nd iter	Diff
User Story Correctness	69%	85%	▲16%
User Story Coverage	69%	85%	▲16%
User Story Completeness	85%	85%	0%
User Story Acceptance	85%	92%	▲7%
User Story flow	77%	85%	▲8%
Communication Level	77%	100%	▲23%
User interests	100%	100%	0%
Efficiency	75%	75%	0%
Influence reduction	75%	100%	▲25%

The result collected from stakeholders of the project indicates that assimilating the GTCM Concept into the eXtreme Programming approach as a user selection methodology has a significant benefit in improving the quality of user involvement as well as the project result. In addition, based on the comments, feedbacks and observations in both iteration implementations of the approach, improvements are made on the model.

The action research provided practical experience-based information on how the new approach should be used in projects. The study also offered an insight into user involvement matrices. The contribution of this part of the study is to guide the development of the model by understanding real practices through implementations and realizing comments from practitioners, and in the end, a more realistic and applicable model can be developed. The final improved model is shown in Figure 5 with consideration of the experts' evaluation outputs.

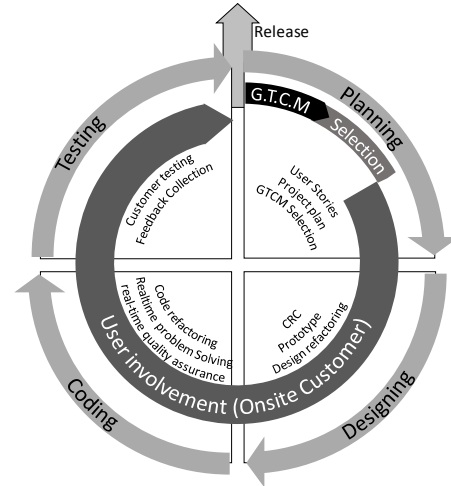


Figure 5: Final Model

6. Expert Evaluation

The main purpose of involving specialists in this study is to evaluate the improved model through the eyes of experts to get a better understanding of the model through critics, feedback, and recommendations to ensure the acceptability and applicability of the model in the industry.

Therefore, profiling of experts is conducted in three major qualification scopes as suggested in [19]. In accordance with the aims, resources, and questions of the evaluation, we tried to answer what is required of knowledge priority, knowledge depth, and the area of expertise. The second scope defines which approach is suitable for the evaluation (in accordance with different categories of experts and expert availability) in such a way to address which perspective, which affiliation, and how to convince. Finally defining who is/are suitable for the evaluation (in accordance with available published information about the experts and the willingness of experts to cooperate in other personal assessment methods) addressing the expert number, experts' knowledge, and experts' attitudes.

Five experts were selected for expert evaluation and their demographic diversity, experience, and backgrounds in agile philosophy and the GTCM approach are considered during the selection.

Primary data is collected through interviews. Five evaluation dimensions are used as evaluation technique [20]: *Goal*, *Environment*, *Structure*, *Activity*, and *Evolution*. *Goal* defines the efficiency, generality, and validity of the artifact scaling the level of correctness when producing the desired

effect. *Environment* consolidates the surrounding people, organization, technology along with their consistency with the people, organization and the technology. The *Structure* of artifacts is assessed by completeness, simplicity, clarity, style, and homomorphism. *Activity* is characterized by completeness, consistency, accuracy, performance, and efficiency. Finally, *Evolution* is characterized by robustness and learning capability of detail and consistency. After evaluation is conducted, key findings from the interviews are individually framed and thematically analyzed.

6.1 Findings

Goal: The experts agreed that the artifact can produce its desired effect on user involvement and it is goal driven and gives a value for users which will create a better extraction of user stories. However, the success of the approach depends on the accuracy of the goal set for the project and collecting feedback from users is a key activity that must be mentioned in the model besides user testing.

Environment: The approach can be considered as consistent with conditions that project managers should be aware that there must be a proper guideline, criteria and proper channels are used when selecting users. The approach creates an adoption between information and technology and connects people with the organization. This will improve the consistency that will enable us to change technological methods without loss of information.

Stricture: Its reflections through the models are complete, simple, and clear. However, suggestions are made to the models that definitions should be placed in the GTCM process to clarify the processes to new readers who are novice to the approach.

Activity: The proposed approach is applicable for dynamic project environments. It is generic and flexible in such a way that it is adapted to any software project environment with intentions to have quality software by involving users for improving their contribution to the development of the software.

Evolution: The ability of such models to be maintained at a certain quality or level is an important aspect of evaluation. Sustainability of the artifact maintaining its simplicity and completeness is evaluated during the interview. The experts approved its sustainability with a reason that the

approach will give the project managers the ability to hold quality users in dynamic ways and further improvements on the approach can give a better result.

6.2 Suggestions and Recommendations

Advices and suggestions made by the experts on the overall stand of the artifact is discussed during the evaluation and summarized as shown in Figures 5 and 6.

Improvements can be made during the implementation of the model by improving the way to reach potential users, using surveys. It is challenging when the user domain is large. In that case it is recommended to use other techniques. The sensitivity of Selection should be considered when publishing the model to public use because it will directly affect the quality of the software.

According to the Evaluation results, the model is considered as a significant contribution to the improvement of user involvement in eXtreme Programming and Agile methodology in general. The findings indicate that it is possible to use the approach for software development projects in the industry and improve user involvement as well as software quality. The results attained from the evaluation reviewed the suggestions, recommendations, and explored the implications of the findings in relation to the evaluation dimensions.

7. Conclusion and Future Work

Both action research and expert evaluation results show that the artifact can provide a good result if implemented in projects. The findings may help to promote success in software projects, improving quality, delivering to scope, promoting timeliness and reducing the cost of eXtreme Programming software development projects.

Further investigations and research could be performed on different process model setups and business cases. Implementation of the artifact with other business processes to further address user involvement challenges and using methodologies out of the software domain to address the behavioral aspects of users to improve user satisfaction could provide a new dimension of addressing user involvement. Other scientific factors that will affect user involvement and overall project success will be considered during further studies. Factors may

include the number of user participants in the project, knowledge and experience of the project team, application of project management techniques, and implementation environment.

The applicability of the approach with the permutation of evaluation techniques to improve the appropriateness and perfection of the selection criteria used in the GTCM process is also a future work.

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