

Towards a Collaboration Framework for Selection of ICT Tools

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Abstract. Appropriate selection of ICT (Information Communication Technology) tools is valuable in project development activities where an organization can setup consistent means of collaboration to ensure that all the stakeholders use specific technology. This paper presents the conceptual framework for collaboration. The collaboration framework facilitates selection of the correct ICT tools for different project development activities. It is designed using a layer based approach and divided into three layers. We believe that the use of the framework will improve the collaboration between the teams.

Keywords: Collaboration, Framework, ICT tools, Collaboration Variables

1 Introduction

A software development process is composed of the following primary activities: requirements engineering, design and implementation, testing, and maintenance [3]. However, the requirements engineering process is a very decisive activity and, it is considered as a base of software development. Problems in requirements engineering practices lead to problems in design which further result in wrong implementation of requirements and continues to testing phase [2][3]. By improving requirements elicitation, the requirements engineering process can be improved, potentially resulting in a much better project development process [1]. Requirements engineering is a generic process and can be used in different domains i.e. software engineering, computer networks, human-computer interaction, selection of ICT (Information Communication Technology) tools etc. Here, we will discuss a requirements elicitation process regarding the selection of ICT tools for collaboration¹.

¹ The term “ICT tools” is limited to ICT tools for collaboration in the remainder of the paper. By collaboration, we mean the process of working together in pursuit of common objectives within a multi-disciplinary project.

According to Engsbo *et al.* [4] the usage of collaboration technologies has increased in project based organizations. The transfer of documents, inter/intra-organizational communication and project scheduling are prominent activities, which require high eminence collaboration. It is challenging to decide how to collaborate between stakeholders during the complete project life cycle; therefore organizations should determine when and which tools are to be implemented. Building a collaboration framework is more than deciding on tools it should cover and enable the all organizational structures including stakeholders, and integration with downstream systems.

Grudin [8] mentions in his paper how collaboration tools can be categorized on time vs. space. Malone [9] discusses the interdependencies between the coordination process and possible ways for managing them. Sarma *et al* [10] propose the framework that is based on the collaboration needs of the developers. The above mentioned studies focus on a particular aspect of the collaboration and are inadequate in providing conceptual guidance to help stakeholders in selection of right kind of ICT tool.

Different collaboration technologies are available but it is challenging to select the right tool from a number of technologies. In order to successfully apply ICT tools in project development activities, an organization needs a framework identifying the tools that fill the communication gap in between project activities. The framework functions as a requirements elicitation technique that can be used to select the appropriate ICT tools.

The framework is conceived as part of an IBBT (Interdisciplinary institute for Broadband Technology) project. IBBT is a virtual interdisciplinary research institute combining research groups and research institutes from all Flemish universities. Research groups with different backgrounds and from different universities collaborate within each IBBT project. This framework addresses the problem of selecting the appropriate ICT tools so multidisciplinary dispersed teams can collaborate within IBBT projects. A literature review, a workshop and survey results as well as our own experience in project activities, are the basis for this discussion. The workshop was organized within IBBT with the purpose to generate the list of project development activities. The survey was also conducted within IBBT to create an inventory of ICT tools that are currently used in IBBT projects.

This paper is organized in following manner: first the overview and background of the framework is discussed. Next, the collaboration framework and the collaboration variables are described followed by the proposed implementation of the framework. Finally, we mention the conclusion and future work.

2 Creation of Collaboration Framework

As can be understood from the previous discussion, some fixed structure within the research area of collaboration and ICT tools is needed. A smooth integration and interoperability between tools are still the concern for a successful collaboration.

In currently available studies, ICT tools are mostly selected using ad hoc methods. There are no fixed criteria or frameworks that can be used for the selection of

appropriate ICT tools. One reason could be that frameworks are not considered as essential and focus is put on selecting ICT tools rather than on how to select the correct one [5]. With the best of authors' knowledge a framework to select correct ICT tools depending on particular project development activities has not been discussed before.

Berander *et al.* [5] suggest a framework for evaluating requirements prioritization techniques. In their framework, independent (e.g. technique), dependent (e.g. accuracy), and context variables (e.g. environment) are proposed, and recommended to be considered in studies related to requirements prioritization. A similar kind of framework is discussed by Gallies *et al.* [6] for evaluating pair programming techniques. Our preliminary collaboration framework is based on the variables that are discussed in the work of Berander *et al* [5]. Details regarding our selection of variables are mentioned in section 2.2.

2.1 Collaboration Framework

This section presents the conceptual collaboration framework. As shown in Figure 1, the framework is divided into three layers: top, middle and lower layer. Stakeholders use these collaboration variables to select appropriate ICT tools from an inventory of tools to support different project development activities. The three layers are discussed below.

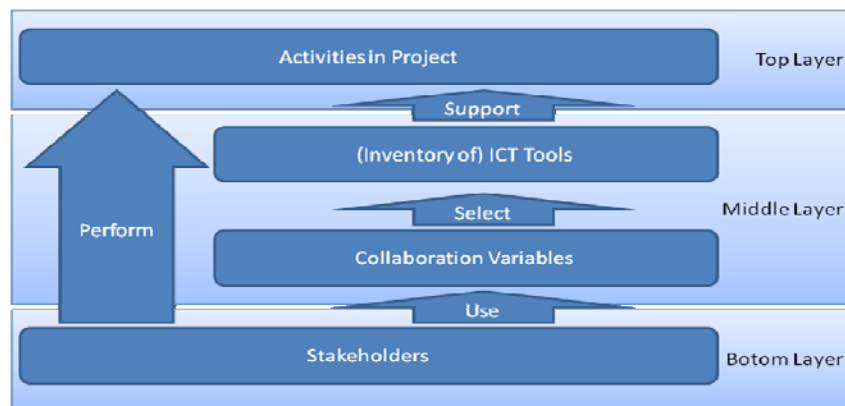


Figure 1. The Collaboration Framework

Top Layer – The top layer contains the project development activities. These are the activities which we consider in this paper to be selected from the workshop results. Some examples of high-level project development activities are project initiation, planning, project execution and completion. An overview of the project activities is shown in Figure 2.

Middle Layer – This layer mediates between the project activities and stakeholders and is responsible for defining the collaboration variables for the framework. The

middle layer is mostly generated by defining variables (see section 2.2) and partially implemented by the developer which facilitates stakeholders to dynamically select tools for project activities (see section 3). It contains two sub layers namely (1) inventory of collaboration tools and (2) collaboration variables. An inventory of ICT tools currently used within IBBT was generated using a survey. The list contains different ICT tools that are currently used in IBBT such as e-mail, instant messengers, wikis, document management tools, project management tools and social networking websites etc. The collaboration variables will be discussed in detail in section 2.2.

Lower Layer – The lower layer of the collaboration framework contains the stakeholders, mainly users and partners that are involved in a project.

2.2 Collaboration Variables

The collaboration variables of the layer collaboration framework contain the variables. These variables will act as a set of guidelines that can be used for the selection of ICT tools. The variables can be used as a checklist which facilitates the stakeholders to take correct decisions and to make sure that no crucial information is missing [5]. We were inspired by the categorization and definition of the variables from Berander *et al* [5], and extended their set of variables with the variables used in the collaboration variables (see Table 1).

Table 1. Variables used in Collaboration Variables

Independent variables	Dependent variables	Context variables
ICT tools	Interoperability	Organization
	Security	Project
	User Interface	Stakeholders
	Platform	
	Ease of use	
	Notification support	

Independent variables – An Independent variable affects an outcome of a study [7]. The choice of independent variables includes the right selection of measurement scales, range of variables etc. [3] [5]. In a collaboration framework, the independent variables are basically the ICT tools that are used in the project. Further, it is also important to mention the purpose of the tool. Most of the time ICT tools can be used for multiple purposes. For example, email can be used for delivering asynchronous messages, or sending documents etc. This related information helps stakeholders to understand the background of ICT tools.

Dependent variables – Dependent variables depend on the treatment of independent variables, they are observed and measured to determine the effect of an independent variable [7] [5]. Dependent variables are basically a result or an outcome of a study [3]. In the collaboration framework, when a number of tools are compared, the

dependent variables indicate, why and how one tool is better than another. Here, we will discuss a few important dependent variables briefly.

Interoperability – It is not convenient for stakeholders to use different tools for different or similar purposes. Interoperability allows two or more collaboration tools to exchange information.

Security – Collaborative systems are vulnerable and exposed to security issues. The ICT tool must provide security measures to prevent malicious attempts. Therefore, security is a vital criterion and should be considered in selection of ICT tools.

User Interface – It is important that ICT tools should provide intuitive user friendly user interfaces especially for collaborative work spaces.

Due to the limited scope of this paper it is not possible to discuss all dependent variables. Other variables, platform, ease of use and notification support should also be considered in selection of ICT tools.

Context variables – Context includes the circumstances and conditions that can affect the results of an occurrence [3]. In a collaboration framework, the selection of an ICT tool depends on the particular environment in which project activities have been performed. Here, we will discuss a few important context variables briefly.

Organization – The organization variable focuses on an application domain, process model, size and location.

Project – The project variable includes the following attributes: size, duration, nature and goal of the project. These attributes should be considered during selection of tools. For example, small size projects do not require the use of wikis or project management tools. They can be managed by using email, instant messaging and light web based utilities.

Stakeholders – It is important to report the detail information about stakeholders including their roles, language barrier (if any), culture, location and experiences. For example, ICT tools that support multiple languages are recommended when stakeholders are from different countries and culture to overcome language barricade.

3. Dynamic Implementation of the Framework

To support framework users, we are currently designing a semi automated system for stakeholders to select appropriate ICT tools for different project activities, called the dynamic framework. This dynamic framework mainly focuses on implementation of tool support for the use of the collaboration variables. A software tool facilitates stakeholders to perform more actions than can be provided by paper based framework.

Figure 2 presents a fictive usage scenario that could be created using the dynamic framework. The list Stakeholder-1, Stakeholder-2 etc represents the multiple stakeholders working on a particular activity of the project. It provides transparency to stakeholders, as they always want to know who is working on which activity of the project and their progress on the project. The blocks represent the project activities; these activities also include the project details (size, complexity, nature). The creation of an overview of the activities in a project, the values of the variables associated to the stakeholders and the activities will be automatically compared with the variables of the available ICT tools, leading to a configuration of appropriate collaboration tools. This configuration would then be adapted and realized.

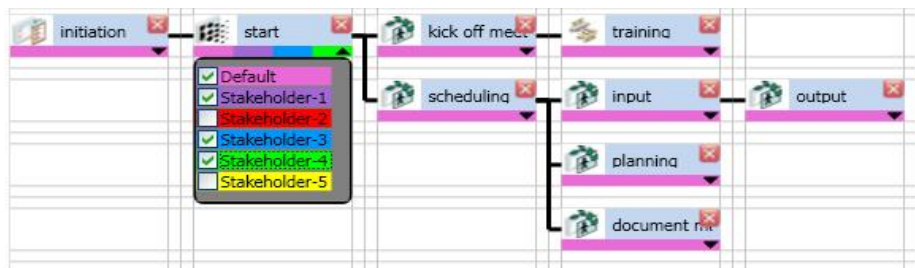


Figure 2. The Dynamic Implementation of Framework

4 Conclusions and Future Work

The main point of this paper was to define a framework for the appropriate selection of ICT tools depending on different project activities and the stakeholders performing them. The collaboration framework proposed in this paper provides a framework using which one can select appropriate ICT collaboration tools. The framework is divided into three layers: top, middle and lower layer. The collaboration variables are an important part of the middle layer and include three types of variables: independent, dependent and context variables. We believe that the preliminary collaboration framework will be a good way to select ICT tools for collaboration. Yet, it is important that the framework is validated and further refined. To validate and refine the collaboration framework and the collaboration variables, the authors will use this conceptual framework in one of the IBBT projects. The authors will also implement the dynamic collaboration framework in the near future.

Acknowledgement

Part of the research at EDM is funded by ERDF (European Regional Development Fund), the Flemish Government and the Flemish Interdisciplinary institute for Broadband technology (IBBT). We would like to thank Lode Vanacken for interesting discussions and valuable comments when reviewing the paper.

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