Narrative Analysis of Systemic Literature Review

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Al-Rawas and Easterbrook (1996) concluded and indicated three major communication barriers in the requirement engineering phase of software development. These are ineffectiveness of the communication channels, organizational and social barriers and restrictions imposed by notations on expressiveness. The study completed in two stages by gathering information through questionnaires and interviews. The research method adopted for the resources were empirical and literature study. The research’s practical implications include an indication of how and where organizational power is used. The research also outlined the extent to which software practices are dependent on documentation as a communication medium suggesting the threats of the gap between two communities and suggests that informal communication should also be used to bridge that gap.

Bjarnason, Wnuk and Regnell (2011) conducted a study to identify factors that affect the communication requirements and concluded four factors namely, temporal aspects, scale, decision structures and common views. The case study was performed at a large software development company where nine practitioners were interviewed. The results obtained in the study were based on empirical data collected from industrial projects at a big company that uses the product line approach. The challenges faced during the research, mainly, were the communication of incorrect requests, E8 wasted efforts and over scoping. It is required to increase the understanding of gaps between causes and risks in requirements to easily point out potential gaps in the communication. Future research on the topic suggests an investigation of different aspects including software development models (waterfall and agile) and different organizational setups to reduce the challenging factors for effective communication.

Calafate and colleagues (2007) published a paper based on a study that uses synchronous text-based communication to study requirement engineering for effective communication. The study concluded that CMC (computer-mediated communication) elicitation is better technology than CMC negotiation. The research method consisted of an empirical study of six groups of academics as stakeholders who attended the requirement engineering activity at the University of Victoria. Each group of a project team (graduates) had to make a document on requirement specifications as a contract between the client team and the developer team. The study suggested that in order to assess the effectiveness of using text-based communication more accurately for requirement engineering, further analysis of the data should be performed.

Damian and Lanubile (2008) carried out research on the effect of computer-mediated communication techniques on the requirement engineering and concluded that requirement negotiations are more effective by conducting discussions related to asynchronous structures prior to synchronous negotiation meeting. In a case study, six academic teams were selected with a total of 32 students of masters and doctoral level to analyze SRS (software requirements specification), considering it as a negotiated software contract between an outsourcing company and a software group. The study indicates that there is a lack of research in the collaborative development of the software, and further studies must be conducted to get more results in improving communication techniques for software development.

Informal and oral communication is very important in requirements engineering, as indicated by the study of Schneider and colleagues (2008). The study provided a comparison of documented and informal approaches of communication and explored new opportunities for process improvement, requirement awareness and innovation of techniques and tools. The focus of the study approach was on quantitative flow models related to requirements flow in both solid and fluid representation while analyzing core aspects of visualization. Fluid information, using new FLOW model, displayed desirable outcomes regarding visualization aspects of informal communication to improve requirements engineering.

Stapel and colleagues (2011) published a paper regarding managing and planning communication channels in distributed development. The research proposed FLOW mapping systematic approach for managing and planning in distributed frameworks and concluded that FLOW management is desirable and sufficient to measure conformance and to plan communication strategy. The study discusses 3 areas of research including Managing communication in GSE, media choice and visual notations. The conformance analysis indicated that the applied strategy had compliance levels from 79% to 88% and it is manageable to plan the communication one day. The study proposes that future research must incorporate the analysis to improve the efficiency of conformance to reduce human efforts.

Coughlan and Macredie (2002) came up with the literature regarding effective communication in requirements elicitation and compared different methodologies. The proposed four-dimensional framework containing four different methodologies to promote a closer relationship among designers and users. These methodologies include MUST, Joint Application Design, ULRC (User-Led Requirements Construction) and SSM (Soft System Methodology). The research method was based on an analysis of several literature reviews related to elicitation requirements. The main challenge for engineers in requirements engineering is the struggle to bridge the gap between explicit and tacit requirements suitable for design. The adoption of a more collaborative view to requirements elicitation embodies increased involvement and contact with users, however, further research work is needed in this field for improvement.

Plachkinova and colleagues (2015) published the study aimed at improving communication about requirements engineering. The study introduced approaches to meet RE communication by a design science perspective and prevented the requirement slipping by adding two transitional phases. The research conducted interviews with three members of a public university in the United States. Two projects that were studied include the use of a peer-to-peer network for copyright violations and related e-mail notifications to the students. There are many factors that lead to the selection of the appropriate artifacts for requirements engineering, which are organizational culture and to match the frequency and intensity of the communication. The future study on this topic must be focused on the technological perspective of RE for efficient communication.

Nurmuliani and colleagues (2004) studied characterization and identification of causes of requirements volatility while focusing on change analysis. The findings of the research revealed that variation in customer needs, increased understanding of the product by developers and changes in the policies of organizations are the main causes of requirements volatility. The cases study was performed at GDS (global development systems). Analysis methods applied for the research were qualitative and descriptive. The limitation of the study is that only a single case study is used to apply change analysis to observe its impacts on requirements volatility. In future studies, taxonomy is required to be validated and to collect more information about requirements volatilities.

Liskin (2015) studied many aspects related to requirements communication including diagrams, user stories, and specifications to support several activities related to requirements. The research reflected that many artifacts are used to support different activities. The method used for research is to use clickable links that can add more content from concerning artifacts, and also, two artifacts are used together to operate with the same content. 21 practitioners from about six organizations were interviewed and they stated that some of the user representatives are observed to experience struggle while thinking in an abstract way. In future, it is proposed that work should be done in order to improve the facilitation of requirements mapping by taking understanding and insight from the study.

Bjarnason and Sharp (2017) studied the role of space and distances in requirements communication. They presented a case study of a project of software development and proved that RE distances impact project coordination and requirements communication. In the research method, they measured 13 requirements engineering distances between project members and also distances between testing artifacts and requirements. The results identified three categories of distances which include distances that can affect requirements communication, those which can indicate strong and weak alignment and those that characterize development models. Future work includes measurement of distances related to the artifacts and further finding ways to explore iRE profiles and visualization of the distances.

Fricker and Glinz (2010) analyzed the comparison of requirements related to negotiation and hand-off. The research paper measured requirements and design volatility and understanding of the architect’s requirements during hand-off and negotiation. The study methods include answering the questions regarding the influence of requirements design and the usefulness of measuring how much requirements are understood by the receiver. The limitation of the study is that it does not consider the understanding of product manager regarding requirements that evolved through design exposure. The future research must generalize the already obtained knowledge by measurement evaluation and to address the understanding of requirements by evolving requirements of the manager.

Marczak and colleagues (2008) investigated information brokers related to requirements in social media and discussed a number of patterns of flow of information and many implications for requirements processes. The research questions related to research methods are related to different types of brokers, their consulting flows and dependent and independent requirements. A Brazilian software development center of a big IT company was used to conduct the case study. The study investigated the presence of brokers and many ways in which these brokers influence information flow.

Niinimaki and colleagues (2010) studied usage and choices of various communication tools in projects with the theory of Media Synchronicity. They found many pieces of evidence that support the applicability of media synchronicity in choosing communication tools for GSD projects. Limitation in using these tools is the language used for practitioners as the most workplaces use the English language as a medium while the majority of the practitioners do not use the English for communication. Further research aspects in this area include the study of the effects of these techniques and tools such as collaborative text editing and microblogging services in more detail.

Few challenges are often observed in the global distribution of software projects. It has been observed that communication gaps such as bad management and inflexible software along with inappropriate communication modes can significantly affect the performance of software projects. The study was conducted by Stapel and the colleagues in the year 2009 to check the flow used for the improvement of communication requirements (Stapel, Knauss, & Schneider, 2009). The perspective specifically gives importance to communication gaps as it should be redressed through flow theory. Eventually, the study evaluated approaches to measure and evaluate the suggestions for future implications. The testing of these projects was completed in three zones, therefore, new strategies and implications should be introduced in globally distributed software projects

The article has evaluated that text-based communications methodology is preferably used among team members of non-technical departments. The research was conducted by Niinimaki and colleagues in the year 2009 to identify the factors that influence communication media (Niinimaki, Piri, & Lassenius, 2009). Communication tools are used to access to communication media that is essentially helpful because of facilities of many to many and one to one communication modes. It has been evaluated that self-conception of bad language skills points to the inclination to practice text-based communication source. The study has explored multiple case study methodology researching eight developmental industries in software projects in two companies working in software industries, that is, Alpha and Beta. The results have suggested that text-based and audio associated communication media are preferably used.

The study conducted by Gallivan and the colleagues in the year 2003, considered a critical case study for user-developer communication process (Gallivan & Keil, 2003). The case study has identified how the project failed despite the availability of user involvement at a higher level. Case study results have suggested researchers that potential benefits of consumer participation should be leveraged instead of taking it for granted. There are communication lapses that can significantly influence user-developer communication procedures. It is suggested for practical implications, to recognize user needs and requirements to prioritize models accordingly in order to reduce communication gaps. Understanding participants and their needs to discuss designs of the models and how it will influence users, should be considered.

A study was conducted by Abelein and Peach, in the year 2012, to evaluate the proposal used in IT projects for the enhancement of user-developer communication (Abelein & Paech, 2012). The research has suggested that user-developer communication approaches can significantly improve system quality and user acceptance. As it is understood that IT projects that are working on a large scale need essentially increased participation and high complexity, therefore, software development and technical specifications are required. The study has identified several trigger points to communicate, such as, variations in primary user needs as a means of communication. Models are significantly required to be developed, to improve user requirements.

It has been observed that user participation is important in effective software systems. Disturbed and altered communication among developers and users is essentially important for the functioning of systems. Better communication can enhance large scale production and project achievement(s). Certain factors can significantly influence communication such as weak interactions among developers and users, coordination among workers and experts to promote a large-scale IT project. These communication gaps were identified through surveys and interviews to improve developer-user interactions. The interviews identified certain factors that are helpful in applying approaches and methodologies to improve user-developer interactions and communication for the promotion of large-scale IT projects.

Collaboration among team members is essentially required to be maintained in a project. The requirements should be developed in accordance with the user and project needs. The research was conducted by Marczak and Damian in 2011, to identify the structure of need-driven interaction in shaping communication strategies (Marczak & Damian, 2011). The study has analyzed that better communication and interaction between necessities and workers can significantly improve goal achievement processes of engineering projects. The study has evaluated that network analysis and better identification of needs and requirements are also helpful in shaping communication strategies. Experts are needed to identify and evaluate the needs of users and projects to effectively develop communication approaches for a successful project.

Various studies have found that handshaking can identify effective requirements for communication and implementation of proposals. Requirements engineering emphasize on better description practices, however, it has been found that effective strategies are essentially dependent on it. Ineffective communication can significantly influence customers’ wishes and it would be hard to run a project without proper assent. It has been found from a study conducted by Fricker and colleagues in the year 2010, that handshaking can significantly improve proposal agreements, and negotiation can also outcome in better and effective communication (Fricker, Gorschek, Byman, & Schmidle, 2010). The best working solutions should be reliable, cooperative and effective through handshaking and negotiation to get approvals and agreements for a project.

It is significantly important for an engineering project to be managed, especially software development systems. If system requirements specification will fulfil its roles and collaboration would be effective, then interest and input from stakeholders would be greater. Collaborative and effective management is required for a commercial project as well as a tool that enables software requirements. The chief requirement of a highly dynamic software is its support and flexibility. The article published in 2001 and conducted by M. Lang to describe that collaborative software is essentially required for the requirements engineering (Lang & Duggan, 2001). Collaborative tools along with an effective design for the management of software is practically important for the engineering projects.

Agile development is specifically dependent on effective communication and feedback. For a project, it is significantly important to note and improve their projects according to the need of users and therefore goals and objectives are dependent on their feedback. The study has utilized an impact on user communication on problems in software of Agile development and was conducted by Korkala in the year 2006 (Korkala, Abrahamsson, & Kyllonen, 2006). Three case studies were analyzed and have evaluated that selection of communication methods is essentially important for the development of Agile software. Face-to-face communication methods and effective and flexible software managements are crucial for better performance. It has been observed that increased pliability on less enlightening communication channels outcomes in greater defect rates.

In worldwide dispersed software plans, the expansion and analysis are frequently distributed through numerous places, starting simulated groups. Additionally, the dispersed plans are so intricate that nobody from team associates can perhaps own all the information about the plan, independently. The study was conducted by Daniela and colleagues in the year 2016 to identify the means of communication among developers and testers (Cruzes, Moe, & Dybå, 2016). Various companies have observed several global software problems particularly in agile testing. Depending upon the task and target, means of communication need to be changed as present communication among testers through written communication ways are not found as effective.

The most communication, highly critical between software engineering requirements, is software development and communication among workers. An empirical analysis was performed by Rodina and the colleagues in the year 2012 to assess means of communication for negotiation (Rodina, Amjed, & Zarinah, 2012). Students were used as subjects for software requirements engineering and the study evaluated that three main communication modes are effective in satisfaction of consumers. Communication mode, face-to-face, was the most effective way to satisfy customers and to negotiate among consumers. The practical implication for better performance needs to be updated as good communication mode, such as, one-to-one communication.

The product management collaboration and assess concerns of market and product development are the essentials of software development. The technological aspects should be considered for the growth of requirements engineering. New models and communication means should be addressed, evaluated and assessed to see how collaborative an organization is to promote its products. The article was published in the year 2008 and was conducted by Fricker and the colleagues (Fricker, Gorschek, & Glinz, 2008). It is important for practical implications to orient and establishes goal-oriented and effective communication modes. The project of software and IT significantly depend on effective and efficient engineering knowledge and communication.

The software requirements need change, such as, requirements-associated network to create information and knowledge among developmental team members. It has been observed that providing developmental feedbacks and visions to the team associates can significantly improve requirements engineering. The project plans and creating awareness among developers and users can improve performance as well. Awareness change is essentially important, as it was conducted by Kwan and the colleagues in the year 2006 (Kwan, Damian, & Storey, 2006). Social network and associations among developers are required to be developed to improve communication and collaboration. Practical implications should be emphasized through awareness and requirement variations among contributors and developers.