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Gamifying requirement elicitation: Practical implications and outcomes in improving stakeholders collaboration ☆

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ABSTRACT

The requirements engineering process is a key phase of the Information System development since it determines its functionalities and its operation. Before requirements can be analyzed, modeled, or specified they must be gathered through an elicitation process. Requirements elicitation is non-trivial because you can never be sure you get all requirements from the user or stakeholder by just asking them what the system should do. Requirements elicitation practices include interviews, questionnaires, user observation, workshops, brainstorming, use cases, role playing and prototyping. However, these common procedures are still prone to be ambiguous or incorrect which can lead the Information Systems to failure. It is consensual that one of the major problem of this activity relates to the communication and collaboration between different and distant stakeholders. Thus, recent studies have been proposing web collaborative tools to gather these stakeholders in order to elicit requirements. The paper aims to evaluate the effectiveness and acceptance of such a collaborative tool which was developed by using a gamification approach and the Six Thinking Hats method. The document also makes a discussion of the implication and outcomes of improving stakeholders collaboration.

1. Introduction

Today we live in an Information Age where people rely on computers and technology to work, socialize or live [1,2]. This technology quite often comes to us through Information Systems. Building such systems is usually a complex and difficult task, demanding a significant effort on planning and managing their development process. Therefore, system designers and developers use the System Development Life Cycle (SDLC) framework which breaks down the development process into a pipeline of activities. Several SDLC models have been created (waterfall, fountain, rapid prototyping, incremental, etc.) but all of them have the requirements elicitation activity as the earliest stage in the pipeline. Before requirements can be analyzed, modeled, or specified they must be gathered through an elicitation process. The aim here is to understand and define how the system will operate [4]. Requirements elicitation is based on an intense communication between stakeholders and between stakeholders and analysts. Therefore, cooperation and collaboration are vital in this process [5]. Requirements elicitation is non-trivial because you can never be sure you get all requirements from the user or stakeholder by just asking them what the system should do. Several studies have been conducted with the goal of edifying common limitations in this process, mainly aiming at understanding the role of communication, collaboration and cooperation between stakeholders. Nevertheless, despite of the research efforts, it still remains unclear how to overcome limitations that can account for 60–70% of projects that fail to deliver on time, on cost and with the scope originally promised [3], costing around 80–100 times more if discovered at the implementation stage and are very hard to fix [4].

Since communication is critical, requirement elicitation tools must ease this communication between stakeholders in order to articulate their needs collaboratively, allowing their meetings even at a different time and place to discuss those needs. In this context, game-based tools can bring numerous benefits to this process since they typically provide immediate feedback, active participation and the high motivation promoted by the competitive environment [5–7].

Recent research as proved the benefits of adding game mechanics to common tasks outside the traditional video games environments [8], including motivational benefits to participate in online communities. This approach is commonly referred in the literature

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as "gamification", a concept that is already used in numerous applications ranging across productivity, finance, health, education, sustainability, as well as news and entertainment media [9].

The paper aims to evaluate the effectiveness and acceptance of iThink system [13], a RE tool, which was developed by using a gamification approach and the Six Thinking Hats method. The document also makes a discussion of the implication and outcomes of improving stakeholders collaboration. The evaluation was based on Action Research in real world organizations: Action Research allowed us contributing with practical actions on the organization and generating knowledge about its context on the real world situations. We performed two Action Research cycles: we studied the problematic situation of the first environment, applied an action, evaluated the results and extracted lessons learnt. In the second cycle we also studied the situation taking into account the lessons learnt from the first cycle, applied an action with iThink, evaluated the results and extracted other lessons [10,11].

2. Requirements elicitation

As stated by Avison and Fitzgerald [4], "the definition of requirements can be problematic, but in relation to information systems, it can be said to be everything that the set of relevant stakeholders want from a system". Requirements are, indeed, the key information in Information Systems Development: they translate stakeholders' needs, determining what and how the Information System will operate [12,13].

Despite many years of computing and research efforts in the requirements elicitation field, this activity is still not well understood. Errors still happen on the requirements elicitation activity and still represent major causes for the failure or even the suspension of the entire information system project [12,13].

2.1. Ineffectiveness

Many authors have been studying the reasons of the ineffectiveness of requirements elicitation activity. For example, Avison and Fitzgerald [4] stated that analysts may not identify all the relevant stakeholders and just capture requirements from a small set of users, raising costly fixes when the time comes to identify forgotten requirements. They also state that stakeholders' time constraints to participate in the elicitation activity promote missed requirements. Finally, they refer that analysts misinterpret requirements because of the culture "gap" or may miss requirements leaving the specification incomplete.

Zowghi and Coulin [13] categorized issues and pitfalls in the requirements elicitation activity based on their revision of the literature and their empirical experience. Their categories of issues were particularity and uniqueness of process and project; complex communication between stakeholders and analysts; quality of identified requirements; conflicts of interests; and experience of the analyst.

Davey and Cope [12] enumerated quite a few problems with requirements, including incomplete, ambiguous, incorrect, excessive and inconsistent requirements. Also, they suggested other problems such as poor users' collaboration, unnecessary design considerations, different views of different users or continuous acceptance of additional requirements.

Resuming, practitioners consider requirements as main reasons for project failures. Within this field of study, there are numerous authors that believe that problems begin with the complex and intense communication between disparate communities involved in the requirements elicitation activity [14,15]. On the one hand, stakeholders do not always know what they want or how to articulate their needs. On the other hand, analysts may not entirely understand business concepts, misinterpreting required needs [4].

2.2. Trends from social sciences

Requirements elicitation is based on communication. As such, the social nature of this activity is undeniable [16]. Previous works, have tried to address the ineffectiveness of requirements elicitation activity that result form this social nature as described in the previous section. Namely, recent trends have been studying and using a range of methods derived from social sciences in order to increase chances of success of requirements elicitation. These methods include: ethnography, interviews and domain group work [13]. Ethnography focuses the observation of people in their natural environment, translating stakeholders' activities and interactions. Some researchers claim that ethnography may have satisfactory results eliciting requirements [17]. Nevertheless, several limitations were also recognized, such as risk of incorrect interpretations, impossibility of identifying new requirements or difficulty of generalizing results [18,17,13]. Interviewing is an informal interaction where analysts explore needs asking stakeholders about the system in use and the system to be [13]. Well-known limitations of interviewing are the limited stimulus–response interaction and the need of participants to share basic concepts and methods [16].

Group work gathers stakeholders to collaborate reaching solutions about an identified problematic situation. Groups are particularly effective because they involve and commit the stakeholders directly and promote cooperation [13]. Examples of such methods are JAD, Creativity workshops or Focus Groups. JAD (Joint Application Development) aims to quickly determine system requirements for an Information System. Stakeholders elicit these requirements through structured and focused discussion sessions about business needs [19]. Nevertheless, Coughlan [15] presented two studies about the practical usage of JAD and criticized the need for a user–analyst interaction that is excessively rigid or the important role of the moderator to keep the session focused on the final product solution. Creativity workshops, based on the Creative Problem Solving of Alex Osborn and Sidney Parnes, encourage creative thinking to discover and invent system requirements [20]. Pennell and Maiden [21] report results and lessons learned from two experiences with creativity workshops. They concluded that this creative thinking must be prepared and incubated in order to truly succeeded. Focus Group is a group-based discussion to obtain feedback from participants on a particular topic. In order to be effective on the discussion, the group has special characteristics: homogeneous regarding key topics, focused on key topics but open to communicate freely [22]. Farinha and Mira da Silva [23,24] applied regular and web-based Focus Groups on real environments to evaluate the success of this method eliciting requirements for the development of Information Systems' projects. The results confirmed that stakeholders effectively discussed different perspectives about the desired system and cooperated in order to formalize requirements. However, some limitations were also pointed out such as the dominance of particular users, or the complexity of analysis or time-consuming on the regular Focus Groups, or the lack of stakeholders' participation on the web-based Focus Groups.

In sum, methods derived from social sciences have address some of inefficiencies inherent to requirement elicitation activity. Nevertheless, every method has its own strengths and weakness, as described previously. Typical weaknesses include dominant participants, biased opinions, high logistic costs and difficulties on gathering stakeholders at the same time and place [13]. Collaboration tools have tried to address these weaknesses as explained next.