

# Requirements Engineering Issues and Challenges in Ukrainian Agile-projects

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**Abstract**—In this paper, a review of scholarly studies related to the issues of requirements engineering in Agile as well as a survey study in the Ukrainian IT community, are carried out. This paper aims to adjust the research done on this issue, to identify the current challenges of requirements engineering in Agile and their impact on the final production. Based on the results of the analysis, further research steps are planned. This paper is a preparation for the search for a technical solution to the identified issues and challenges and contributes to the theoretical knowledge of requirements engineering problems in Agile.

**Keywords**—Agile; requirements engineering; software requirements; requirements issues; requirements challenges.

## I. INTRODUCTION

The Agile development methodology has played a significant role in the development of the IT industry. It replaced standard software development methods at the beginning of the 21st century. Those methods such as the Waterfall model have proven ineffective in today's environment where customers demand mobility and rapid adaptability.

Agile development methodology has gained wide recognition in the IT industry [1], creating numerous frameworks such as Scrum, Kanban, XP, Lean, and others. Its effectiveness allowed it to successfully implement changes in software development.

At the same time, the adaptation of Agile to requirements engineering (hereinafter abbreviated to RE) requires deeper research into the following questions: how Agile concepts affect RE; what new issues may arise in the development process, etc. Special attention should be paid to RE in large-scale Agile projects, where RE deficiencies can reach critical mass.

The results of a primary study of the outlined topic are described in the scope of this paper. Its purpose is to identify the current issues and challenges facing RE in Agile, particularly in the Ukrainian IT industry.

## II. LITERATURE REVIEW

An analysis of published papers and literature regarding the requirements engineering in Agile was conducted as the first step of the study.

The research shows that Agile improves software development productivity and reduces risks of redesign in global software development (GSD). However, Agile methods can influence requirements engineering activities and generate new challenges [2]. Agile's contribution to optimizing project productivity and resources was admitted. At the same time, it is noted that the focus on product delivery can weaken the links between design and quality control. Weak requirements engineering can lead to failed projects [4]. In such a case, on large-scale Agile projects, requirements engineering and software quality control processes may become significantly overcomplicated [5][6]. The study identified 11 challenges caused by Agile in requirements engineering, including the most common ones such as a lack of software requirements specification, unavailability of the customer to clarify requirements, inappropriate architecture built without considering future requirements, and neglect of non-functional requirements.

It was identified that the main reasons for such challenges in Agile are the changeable environmental conditions of the methodology, as well as the lack of structured and complete software specifications. The solutions proposed in the literature partially solve the identified issues, but might create an additional burden on the processes of requirements engineering.

It was concluded that Agile is effective in the short-term software development projects. However, it loses an advantage in the long term due to a number of reasons, including insufficient requirements specification.

The question of Agile requirements engineering challenges required further research and more data for analysis. However, the complexity of this subject area should be taken into consideration. The unregulated flexible nature of the methodology makes it complicated to identify common factors for further investigation. In addition, the predominant use of Agile in private enterprises and organizations limits access to projects' data, due to the "trade secrets" concept.

## III. SURVEY STUDY

### A. Study Planning

Further requirements engineering issues analysis in the Ukrainian IT industry was based on a survey study of the domain area. The strategy of the study, as well as

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inclusive and exclusive criteria for the collected data, were developed. The following study objectives were established:

- To identify issues and challenges of the requirements specification stage;
- To identify the requirements engineering challenges impact on the commitments' fulfillment between the development team and the customer;
- To identify tools used in Agile projects to manage and store requirements.

To collect data, it was decided to utilize the experience of the Ukrainian IT segment employees working in commercial projects. The following subcategories of respondents were defined for the study:

- Requirements Managers (denoted below as RM);
- Requirements Consumers (use of requirements to create a product, denoted below as RC):
  - Software Developers (denoted below as RC-DEV);
  - Quality Control Engineers (denoted below as RC-QC).

To ensure a more independent sample of respondents for this study, a self-administered online survey was conducted in IT professional communities such as LinkedIn, DOU.UA [6] and through direct texting to private communities of the Telegram service. It was decided to use the SurveyMonkey.com online service for centralized research, questions design, answers collection, and analysis.

### B. Study Conduction

The study was divided into three parts. The aim of Part #1 was to collect data about the respondent's portrait. Part #2 collected the respondents' evaluation of the qualitative characteristics of Agile projects, software requirements issues, and their impact on the final project's outcomes, based on the acquired experience. Part #3 of the study gathered information about the tools and techniques used by respondents to create and manage software requirements.

Before the main launch, a test run of the survey was conducted to obtain feedback on the clarity and relevance of the questions. As a result of the test, a number of questions were corrected. Strategy development and research design were conducted in May 2023. The test launch of the study with subsequent adjustments was carried out from May 31 to June 5, 2023. The main data collection stage was conducted over three weeks, from June 6 (sixth) to June 25 (twenty-fifth), 2023.

### C. Study Findings

Most respondents (approximately 37%) had experience in the IT industry from 5 to 10 years. Significantly fewer (28%) had 3 to 5 years of experience, about 9% had less than 2 years of experience, and approximately 25% had more than 10 years of experience in the industry. The median number of projects on which respondents worked was 5 projects,

and the median was 4 projects. All respondents had an Agile project experience, and the collected data was considered valid.

Most respondents agreed that long-term Agile projects tend to get issues with requirements specifications (see Figure 1). At the same time, respondents' subcategories responses indicate that requirements consumers estimate such a trend to be much more likely than those who create and manage requirements. The most probable explanation for this effect is that requirements consumers are more likely to encounter requirements' defects and issues.

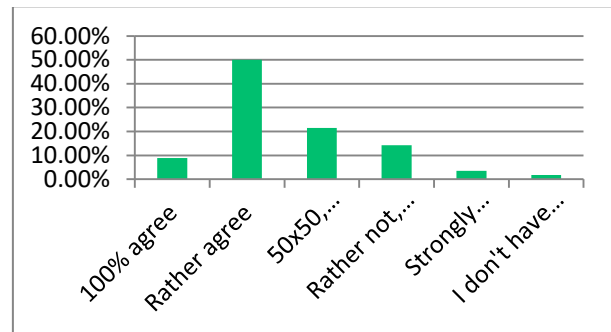


Figure 1. Responses regarding the tendency of Agile projects to get requirements issues in the long term perspective

Over 37% of respondents indicated that they face software requirements issues in every Agile project. About 23.5% indicated that such issues occur in most projects, and almost 27.5% - in every second project (see Figure 2). In particular, 83% of respondents from the RC-QC subcategory claim that every project has requirements issues, that might affect the quality control engineer job. Further research is needed to confirm this hypothesis.

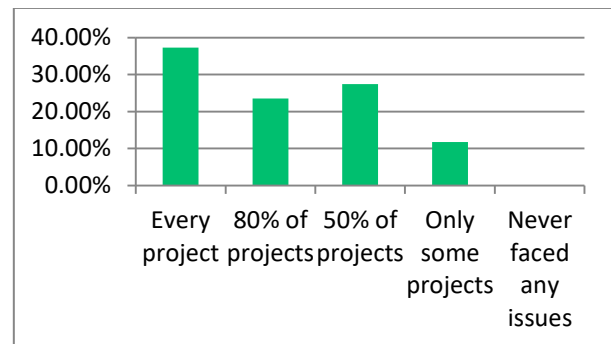


Figure 2. Responses regarding the frequency of requirements issues in Agile projects

Respondents confirm a lack of proper documentation as the root cause of Agile requirements engineering challenges. The most common issues are missing or incomplete requirements for legacy functionality (64%), inconsistency due to requirements storage in different systems (36%), and requirements traceability and decomposition, which reduces transparency (34%) (see Figure 3). Below is the legend of the indicated figure:

1. Missing/incomplete requirements;
2. Inconsistency requirements;
3. Non-structured requirements;
4. Lack of requirements audit/versioning;

5. Lack of requirements integrity;
6. Different requirements templates;
7. Lack of requirements traceability/decomposition;
8. All of the above;
9. None of the above.

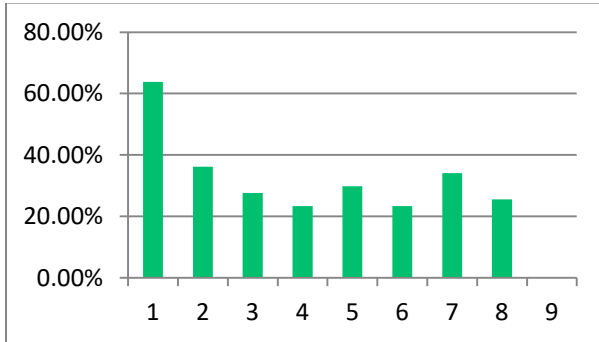


Figure 3. Responses regarding the main challenges of software requirements

Most challenges/issues were found to be of equal importance, except for the missing/incomplete software requirements and some challenges in sub-categories. In the RM subcategory, the response trend coincides with the overall result. In the RC subcategory, the role of storing requirements in different systems decreases, instead, the importance of standardized templates and requirements inconsistency increases. For the RC-DEV subcategory, the values of such challenges as "non-structured requirements" and "lack of requirements audit/versioning" that have an impact on software requirements maintenance are reduced. For the RC-QC subcategory, the importance of standardized requirements templates is 60% and is the second most important factor after the incomplete requirements.

58.7% of respondents noted the human factor to be the root cause of software requirements issues, meanwhile 15% considered the imperfection of the Agile methodology itself as the one. The responses pointed to the changeable business context and the rush as key factors in the software requirements issues emergence.

A separate challenge, already identified from the literature review analysis, is the lack of project and employees time (see Figure 4).

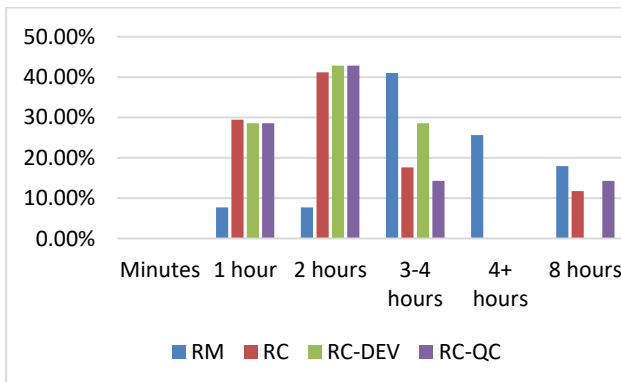


Figure 4. The average time that respondents spend working with requirements on a daily basis

Respondents in the RC subcategory tend to spend one to two hours working with the requirements, while respondents in the RM subcategory regularly work with them for three hours or more. Taking into consideration the responsibilities of the RM subcategory respondents, such a finding is expected. However, in Agile, time is a really valuable and limited resource. Reducing requirements-related time-spending can improve the working conditions and efficiency of the development team.

About 73% of respondents faced unfulfilled commitments with the client, which led to the project's deadline postponement or cancellation. About 55% of respondents emphasized software requirements issues as the main factor behind such failures (see Figure 5).

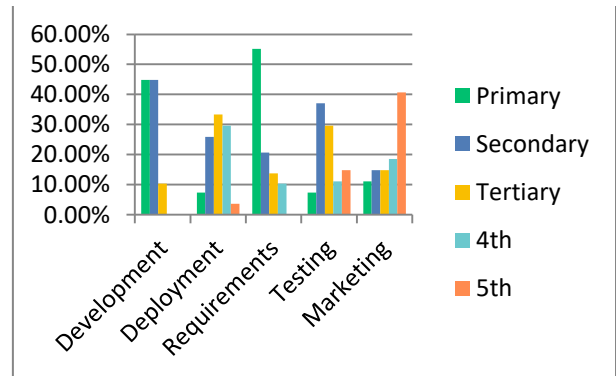


Figure 5. The influence of the main factors on the cancellation/postponement of project commitments

Almost one in two respondents indicated software requirements issues as the primary factor behind unfulfilled commitments. More than half of them encountered this phenomenon in 2/3 of all projects, and 37.5% faced it even more often. For comparison, 46% of respondents indicated development issues as the primary factor behind unfulfilled commitments in almost every project. Thus, software requirements issues take the strong secondary, if not the first place in terms of the project commitments fulfillment.

As for software requirements management tools, ten of the most popular IT systems (according to the appearance in Google Search) were provided to respondents for comparison:

1. Atlassian Jira;
2. Atlassian Confluence;
3. Trello;
4. Azure DevOps Server;
5. Jama Software;
6. ClickUp;
7. IBM Rational DOORS;
8. HelixALM;
9. iRise;
10. Microsoft Office/Google Docs/etc.

It was identified that Atlassian Jira and Atlassian Confluence are recognized as the most convenient requirements management tools on the market. However, it should be considered that neither Jira nor

Confluence are designed as tools for direct software requirements management. Atlassian Jira is a project issue-tracking system, meanwhile, Atlassian Confluence works as a corporate wiki service. Moreover, using Confluence might mean that many Agile projects move away from the original concept of using only user stories and backlog as requirements and combine Agile methods with traditional ways of managing or at least storing requirements.

#### IV. CONCLUSION

A survey study, conducted in the Ukrainian IT community confirmed the existence of software requirements issues, especially at the requirements specification and maintenance stages, allowed to identification of the main activity types IT employees have with software requirements, as well as requirements issues relevant to various subcategories of IT workers, related to the requirements specification in Agile projects. Also, it was identified the relationship between the requirements engineering issues and non-fulfillment of project commitments, and therefore - the direct impact of the requirements engineering effectiveness on the time and resources of the IT project. Finally, data about the current requirements engineering and management tools were collected for further analysis.

Based on the conducted literature review and study findings, it was concluded that to resolve the requirements engineering issues and challenges in Agile projects there is a need for a requirements-oriented software tool, aimed and capable of automatically managing and maintaining requirements specification. Such a system should meet the needs of IT workers and satisfy the main needs of the Agile requirements engineering. Thus, the next steps in this domain area investigation should include:

- To conduct the comparison analysis of the existing requirements engineering and

management tools to better define advantages and disadvantages of existing solutions;

- To collect requirements for the requirements management system based on available empirical data with further research and additional information gathering;
- To investigate the technical tools and technologies to define solution/implementation options of the proposed information system based on the collected requirements.

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