

Challenges faced by practitioners in Agile-Crowd Development; an industrial perspective

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Abstract: Crowd source software development is getting popular for many of its promising features. As an emerging approach, it does have many challenges too. Some of the challenges specifically occur when crowd sourcing is carried out in an environment where agile methodology is used. Crowdsourcing is somewhat waterfall and involves crowd, which contradicts with the principles of agile. In order to make crowd-agile a better working approach, first it is deemed important to identify the challenges practitioners face while working in crowd agile setup. We have conducted an industrial survey and analyzed the data to identify the challenges faced by practitioners. This will help the researchers in further working on the betterment of crowd-agile environment.

Keywords: agile methodology, crowd source software development

I. INTRODUCTION

Software industry is growing so fast, that the software nowadays is started to develop globally through a crowd of known people, rather than the old fashioned in house development [1]. This kind of development is taking over the industry, where a group of unknown people develop the software from across the world. It is known as Crowd Source Software Development [2, 3]. CSSD was defined in 2006, by Howe [2]. This approach involves a large group of heterogeneous people to develop [4]. Agile is one of the most followed methodology in software development industry. Main reasons of its popularity are flexibility, its promising feature to deliver services in shorter period of time. Agile has a huge emphasis on communication, team coordination and iteration. It is usually suitable for medium scale and co located teams [5]. However agile is customized and scaled to fit for global and distributed software development [6]. Agile Global Software Development (AGSD) is a topic of discussion by the researchers for quite some time [7-9]. CSSD is also an emerging topic and researchers find it important to discuss the merge of agile and CSSD [10]. There is no much research on CSSD and Agile together [11]. In our study we intend to discuss the challenges faced by practitioners when they follow

crowd source software development while staying in agile setup.

II. BACKGROUND

There is not much evidence of crowd agile development in literature. Stol and Caglyan in 2019 [10] conducted a case study and literature review discussing crowd source software development. This study emphasizes the need to study the integration of agile and crowd source. Companies are already using crowd sourcing while staying in agile environment. Researchers need to contribute in knowledge by studying this merge of two approaches. A study was conducted by Mishra et al. in 2017 [12]. It tends to investigate the latest trends of agile methodology. This study also revealed that many organizations that are following agile methodology are also doing crowd source software development. But in research their integration is yet to be explored.

CSSD is mostly like waterfall approach but has some characteristics as of agile development. But mostly both these approaches have traits which are conflicting to each other. Tsai et al. in 2015 [5] compares crowd source software development with other processes. Agile development is best suited for co-located organizations whereas crowdsourcing is done globally. Agile focuses on face to face communication whereas people are globally located and do not know each other, in CSSD. Agile has designated teams and focuses on their incentives and in crowdsourcing anonymous people are work on a project connecting via social media platforms. Researchers have started working on the merge of agile and crowd sourcing [11]. In our previous work [13] we have conducted an SLR to find out the challenges of agile crowd development. A list of possible challenges from this SLR is presented in Table 1.

Table 1: list of possible challenges for crowd agile

Suggested name	Suggested category
Trust issues among team/ crowd Team/crowd organization Team/crowd performance issues Motivation and remuneration issues.	Team issues
Less communication within team Less communication with customer Communication process issues Cross team communication Communication medium issues Communication overhead	Coordination and communication issues
Organizational difference Legal considerations Technological issues Planning and scheduling issues	Organizational issues
Configuration and version management Quality assurance Costing issues	Project
Task design Task assignment Task monitoring	Task

III.METHOD

We have conducted an SLR to identify a list of possible challenges that can be faced by practitioners. However as there is no much evidence about crowd-agile challenges in literature so the list of possible tasks need to be validated from industry. For this purpose we have constructed a survey. The survey participants who are working in the software development industry where agile is followed and they are involved in crowdsourcing too. The survey is designed to validate the previously identified challenge (from SLR) and to identify any new challenges that are faced by the practitioners. This survey is designed by following the guidelines of Mark Kasunic [14]. We followed his work because this is the most widely used guideline for designing and conducting survey in the field of SOFTWARE ENGINEERING.

IV.SURVEY DESIGN & EXECUTION

As crowdsourcing and agile is not widely used in the industry, the target audience for this survey is globally located and will have to be reached through emails and web-based questionnaires. Snowballing approach is used upto wave 2. Questionnaire is carefully designed keeping in mind our survey objectives; confirm the challenges faced by development practitioners or managers while they are working with crowd sourced software development and crowd sourced software project management while using agile methodology and identify any new challenges which are faced by them. The questionnaire is divided into different

sections according to the main categories of challenges. Questionnaire starts with presenting the objectives of the survey followed by a disclaimer that only the people working in agile as well as CSSD should fill this questionnaire. First section of the questionnaire is related to the personal information. Rest of the sections are divided according to the main challenges of CSSD and agile. Each section follows one category. In each category there are some sub challenges. Questionnaire is structured as well as unstructured. Closed ended questions are ranked on nominal scale. . At the end of each section respondents are asked to mention any other challenges which are not specified.

We started with our acquaintances who were working as project managers in OSLO, UK and Pakistan. Their company was performing crowdsourcing software development and were also using agile. We requested them to recommend some practitioners from their company in order to proceed snowballing. Initially we had planned 5 waves of snowballing, but as the population was rare and we stopped getting any recommendations so we ended the snowballing process at wave 3 after waiting for 2 months. To get more responses, along with snowballing, we also posted our survey on different social media platforms. Facebook, twitter and LinkedIn were used for this purpose. Many agile groups were joined on Facebook. Topcoder, Mechanical Turk and Github were also joined

V.RESULTS AND ANALYSIS

5.1 Frequency of occurrence for each challenge

Survey respondents comprised of different roles involved in software development through crowd agile. As many respondents appear and they have different opinion, in order to have an overview of their problems, we took a mean of the rating they have given to each challenge. Respondents were asked to rate every challenge from 1-5 depending upon its frequency of occurrence where one means least frequent and 5 means extremely frequent. To have a synthesized opinion by each role, we filtered the responses from each role using excel sheet, and took a mean of responses for every challenge.

The overall results show that the most occurring challenges for the practitioners who work in an agile setup and perform CSSD as well are: costing issues, communication process, cross team communication, motivation and remuneration, quality assurance, scheduling and planning, communication with client, crowd performance and trust issues among crowd. This is shown in Figure 1.

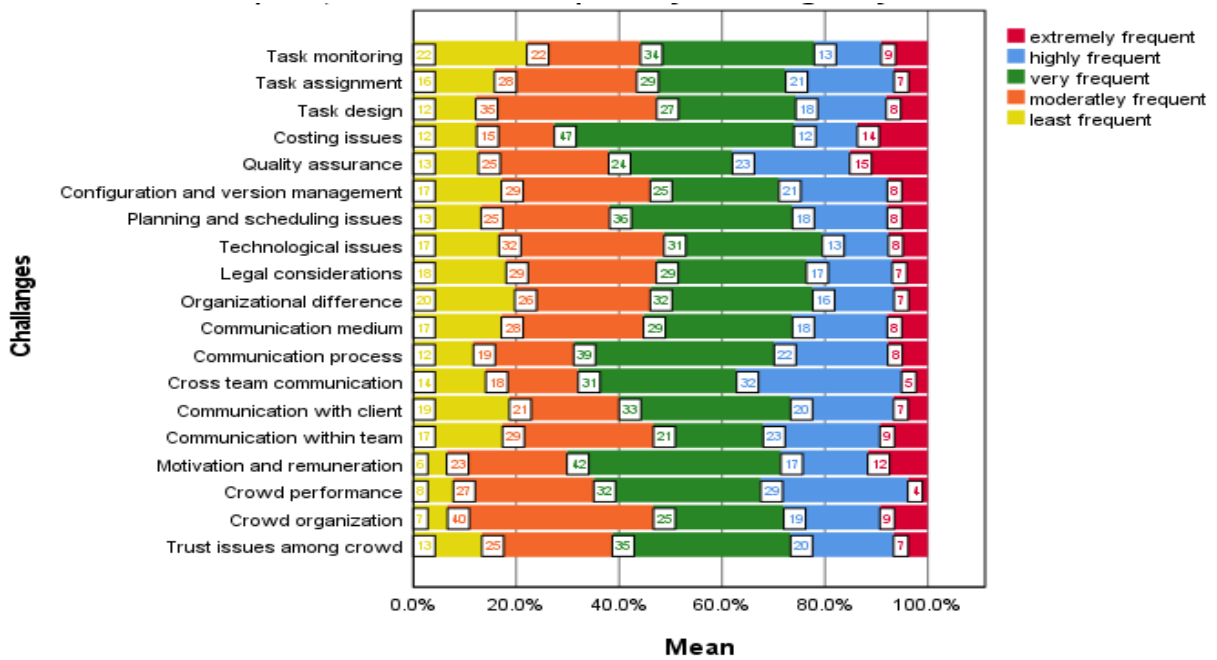


Fig 1: Ranking for each challenge

Frequencies of challenges are represented in a doughnut chart too to make our findings more clear and verified. The frequency pie chart is shown in the Figure 2. On the right hand side are the legends of the pie chart, which represent the colors through which legends are represented. This is a 5 tier pie chart which shows different frequencies according to the percentage of occurrence. The inner most tier shows the percentages of extremely frequent items, the second tier shows highly frequent items, third tier shows very frequent items, fourth tier shows the moderately frequent items and the outer most tier shows the least frequent items. If we see the inner most series that represents the percentages of extremely frequent challenges, it shows that according to our 10% population “quality assurance” is extremely frequent, 8%

respondent say that “costing issues” and “motivation and remuneration” is extremely frequent. The second highest frequency is labeled as “highly frequent”. According to respondents, majority 9% respondents have ranked “cross team communication” as a highly frequent challenge. For 8% population “crowd performance” is highly frequent challenge. 7% of our population have ranked “motivation and remuneration”, “communication process” and “costing issues” as very frequent, as they ranked these challenges as 3 on our ordinal scale.

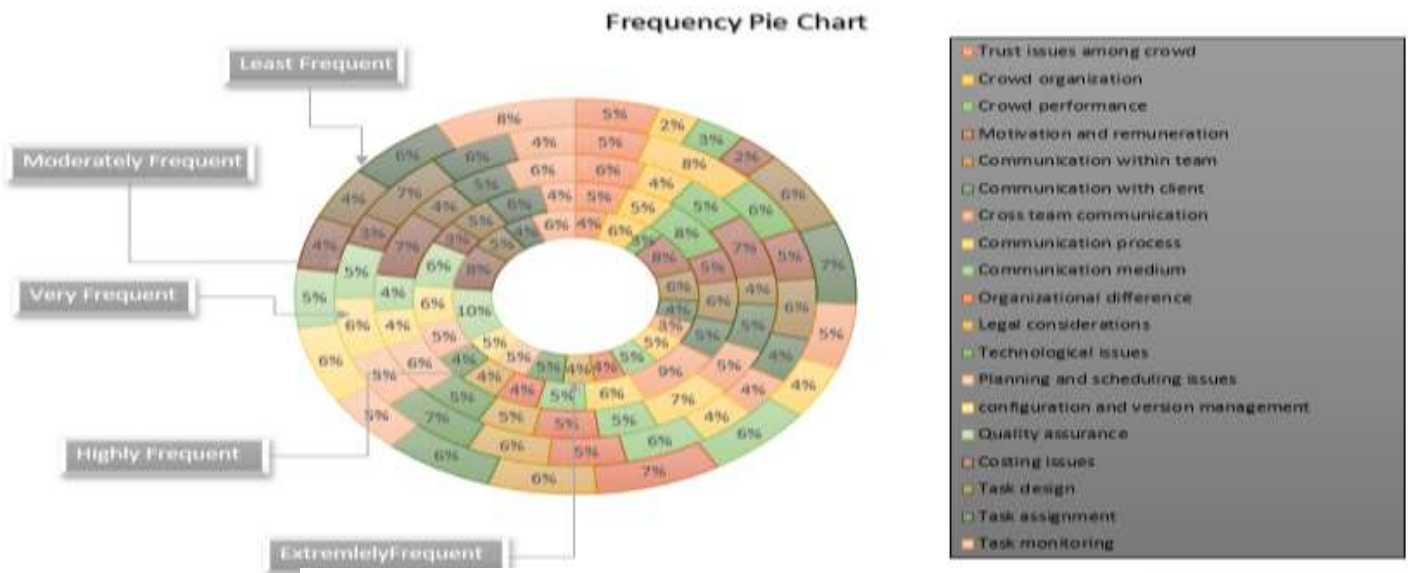


Fig 2: Frequencies of occurrence for each challenge

by practitioners doing crowd sourcing while working in an agile environment. Figure 3 shows the final list of challenges.

5.2 New Challenges from the survey

Survey respondents not only confirmed and ranked the already provided list of challenges, but also added some new challenges that they face. A detailed analysis on these newly identified challenges is done which is out of scope of this paper. Some challenges are merged into the previously identified challenges. Some challenges were told by only 1 or 2 respondents. Challenges which are told by only 1 or 2 respondents are not included in our final list. These newly identified challenges are

- Time management issue
- Up skilling crowd
- Resource provision
- Lack of knowledge and understanding by crowd
- Unrealistic deadlines
- Requirements gathering
- Politics within crowd

5.3 Challenges faced by practitioners for Crowd-Agile development

The results from SLR and survey are analyzed and combined to present a final list of challenges which are faced

6. CONCLUSION

In this paper we have identified the problems which practitioners faced during crowd source software development while working in agile setup. This is the verified list of challenges from literature and industry. This can be helpful for researchers for further research as agile-crowd is relatively a new term in literature. In future we intend to propose the strategies for these challenges. We are also working on the detailed analysis of these issues identified from the industry.

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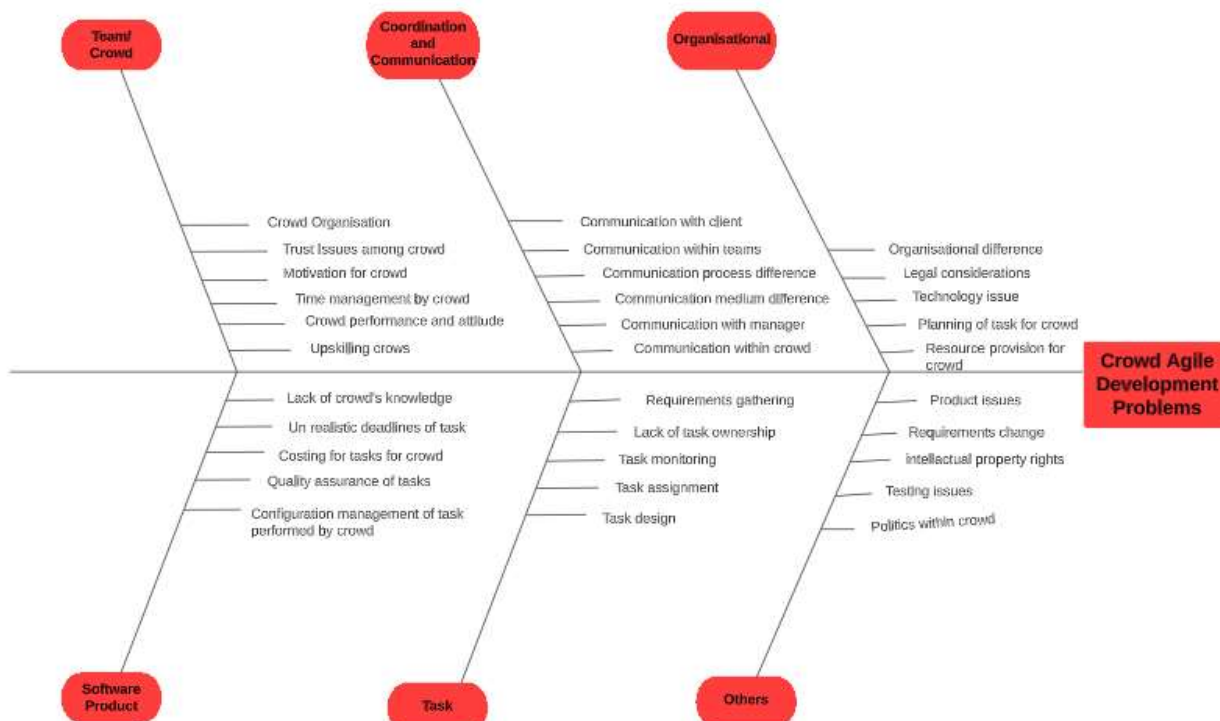


Figure 3: Challenges of Crowd Agile Development

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