

## Challenges in Assessing Agile Methods in a Multisite Environment

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**Abstract**—Organizations utilize agile development methods in addition to multisite environments with the intent to reduce costs and development time. Assessment results and possible challenges of utilizing and adopting such methods are typically qualitative and lack concrete evidence of the challenges. An assessment survey instrument was used to analyze the transformation of a multisite software development organization from waterfall-type development into agile development. The transformation was done in two globally distributed sites in Finland and India. The assessment survey was conducted in the Finnish site 6 months after it had changed its working methods, and again 12 months later in both sites. The site in India had adopted similar methods after the previous assessment survey was conducted. The results of the assessment survey in the Finnish site indicated regression between the two assessment rounds, while the results in India appeared to be better compared to Finland in the second round. Analysis of the results suggests that cultural differences and time elapsed from the organizational transformation may influence the assessment results and should be taken into account when assessing the implementation of development methods.

**Keywords**—organizational change; global software development; agile methods; Scrum; process assessment.

### I. INTRODUCTION

This article extends previous work in [1]. Adopting agile development methods such as Scrum [2] and extreme programming (XP) [3] have seen a great deal of interest in the software development community because of their claimed benefits of delivering working software and being more responsive to changes, among other reasons [4]. However, scaling agile methods into larger organizations than those with a single or a few teams has come with some difficulties yet there have been several descriptions to address the matter (e.g., [5][6]).

As development organizations become larger, they often also spread out globally out of necessity or because of their business environments [7]. This, in turn, tends to cause a whole array of issues to be considered while managing the development work.

This article describes selected results of a quantitative process assessment conducted at a medium-sized software development organization. The organization adopted a Scrum-based software development process in their multisite organization. The adoption and the assessment

were conducted in two phases. First, the process was adopted by a smaller unit in Finland with approximately 30 people. The unit was later assessed approximately six months after the adoption. With the experience gathered from the first site, similar processes were adopted in another site of about 50 people in India, within the same organization. The assessment was then repeated at both sites.

The aim of this article is to provide evidence of issues in assessing the implementation of organizational changes such as new development processes in a global software development (GSD) organization, or other multisite organization.

The remainder of the publication is organized as follows. Section II contains a description of related work as literature background of agile development methods and global software development. Section III presents a description of the assessment process and Section IV a description of the organization in which the assessment was conducted. Section V presents the relevant results of the assessments. Section VI includes discussion based on the results and the paper concludes in Section VII.

### II. RELATED WORK

Several methodologies gained popularity in the late 1980's to early 1990's to challenge the prevalent waterfall development processes. Early methodologies include the spiral model [8] and incremental development methods [9]. Later, these methodologies and their influence spawned the agile movement to give more practical descriptions of how to develop software.

The agile movement gained publicity within the software development community during the 1990's, and was later epitomized in the agile manifesto, published in 2001 [4]. The manifesto was a collaborative agreement of what practitioners saw as the values and principles of agile software development. The original manifesto reads [4]:

*“We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:*

*Individuals and interactions over processes and tools  
Working software over comprehensive documentation  
Customer collaboration over contract negotiation*

*Responding to change over following a plan*

*That is, while there is value in the items on the right, we value the items on the left more."*

In addition to the actual manifesto, the authors also described twelve principles behind it [4]. These twelve principles were agreed as common to the agile practitioners, although agile methods had already been described and were in use in many different settings. 'Agile methods' is an umbrella term for a wide different set of approaches (e.g., Scrum, XP and Kanban [10]), that have challenged the traditional waterfall model of software development and introduced a more lightweight process of producing software [11].

Today, Scrum can be viewed as the most widely used agile software development approach, but the first description of a 'Scrum team' was in an article about flexibility on traditional new product development [12]. In many ways, the software development waterfall model that Scrum challenges, can be characterized as similar to the stage-gate model [13] in physical product development - exactly what the Scrum-team was designed to challenge.

There are several defined roles, meetings, practices and working methods in the Scrum methodology. One example of typical practices in Scrum is the sprint retrospective. The retrospective is a meeting held after each sprint for inspecting and adapting the process and environment of development [14].

The main difference between Scrum and waterfall type of development is the iterative nature of development work. Key differences between all agile methods and traditional software development include iterative development and promoting empowered teamwork. However, a common misinterpretation of agile software development is that agility is achieved with practices and tools [11], although the focus should be on being agile, instead of doing it [4].

During the same time that agile methods started to become increasingly prevalent in software development, globalization of high-technology businesses have increased the need for GSD. Software and its use as both products and services has become a competitive weapon, which must be utilized efficiently to stay ahead in high-technology competition [7].

The factors that have accelerated this trend include [7]:

- the need to capitalize on the global resource pool to successfully and cost-competitively use scarce resources, wherever located;
- the business advantages of proximity to the market, including knowledge of customers and local conditions, as well as the good will engendered by local investment;
- the quick formation of virtual corporations and virtual teams to exploit market opportunities;

- severe pressure to improve time-to-market by using time zone differences in "round-the-clock" development; and
- the need for flexibility to capitalize on merger and acquisition opportunities wherever they present themselves.

According to [15], the benefits of GSD include reduced development costs, cross-site modularization of development work, access to large skilled labor pool, and closer proximity to markets and customers.

One of the most obvious benefits of GSD is reducing costs by moving development work into countries with lower wages. This is also the main driver for many companies to utilize GSD. However, distributing work among different locations reduces the cost savings by adding complexity to development projects with added communication interfaces [15].

Another benefit of GSD is the modularization of development work across sites, which is intended to reduce cycle-time of development. Modularization of work can cause integration issues since development work is separated and, therefore, needs to be addressed when designing modularization of work. Organizations have divided development work between sites based on features or development modules, but also created co-located or virtual teams that share the workload between sites [7][15].

It is also widely known that the skilled developers have a high impact on development speed and quality. Many organizations utilize GSD to access skilled labor pools in lower cost countries such as India or China when local resources are not abundant enough to fulfill the needs of organizations. Larger labor pools also provide for greater opportunities in scalability of the organization [7]. However, the attrition levels are higher in low-cost countries, which is a disadvantage in any development organization [15].

There are also benefits in locating developers closer to customers in some cases. By having developers with culturally and linguistically similar backgrounds as the customer, misunderstandings become rarer. Of course, the organization has to then find a balance between cultural divide internally and externally [15].

Although GSD is also intended to reduce time-to-market by utilizing "round the clock" development [7], as [15] has pointed out, the intended benefits of leveraging time-zone effectiveness and innovation and shared practice may not be that abundant in GSD. The differences in time-zones may not actually provide benefits for GSD and may, in fact, be a hindrance for development work. Time-zone separation reduces collaborative time window and may cause unusual working hours for both parties [15].

Also, the sharing of innovation and best practices among different locations may be problematic in some organizations. Employees who feel threatened by their lower cost colleagues may not always be willing to share all of their knowledge, which reduce the benefits of having best practices shared among the organization [15].

The challenges of GSD have been described in several sources (e.g., [15][16][17][18][19]). Issues range from strategic level issues such as how to divide work between different sites, to more tactical level problems like how to arrange effective daily communication channels, to more complex systems like cultural differences and their effect on project and process management [7]. It is clear that many types of issues become apparent when dividing any kind of work globally, and with development work that often realizes inside developers' and designers' heads, the problems can be all the more difficult. Methods have also been proposed to reduce the effects of the challenges involved with GSD. These methods range from the use of maturity models [20] to suggested practices and techniques [18].

As organizations try to improve their processes and products, they often turn to assessments to get further understanding of their processes. Some of these assessments have also been conducted in global development environments (e.g., [21]). Similarly to the identified challenges with GSD, analyzing assessment results from GSD organizations may also contain challenges that are unknown. This is true for assessment results in any multisite organization, not just for GSD organizations.

The challenges that have been described on GSD and on agile adoption are often based on interview studies and are qualitative by nature. There is a lack of quantitative assessment data on GSD environments and the effect of the challenges in the assessment data. The following sections provide an example of the issues that are related to assessing the implementation of agile methods in a multisite environment.

### III. RESEARCH METHOD

One of the challenging things in any organizational transformation towards a new way of working is how to assess the transition process and guide the next steps. This research was conducted using the *Lean and Agile Deployment Survey*, which is an assessment instrument developed by the University of Oulu in collaboration with industrial partners in the Cloud Software Program [22] in Finland. The instrument is specifically designed for enabling an effective transformation to a lean and agile way of working. The survey is based on a generic structure of three organizational levels; portfolio, program and project [6], and focuses on four main dimensions: organizational set-up, practices, outputs and culture/mindset. The survey was part of a larger effort that University of Oulu was performing in identifying the right agile practices to adopt and to determine whether organizations are ready for lean and agile. Additionally, the approach is meant to provide information for deciding what necessary preparations and potential difficulties may be faced during the adoption process.

The conducted survey contained four context information questions for analyzing purposes, and over 70

statements that described the organization's agile development process as it had been planned and taken in use internally. The statements were tailored from general statements in the *Lean and Agile Deployment Survey* to correspond with the terminology and processes of the case organization. Some generic examples of the statements are presented below:

- *The product backlog prioritization is clear.*
- *The product owner guides the Scrum team by prioritizing the user stories.*
- *I understand when the user stories are complete and can be accepted within the sprint.*

### IV. CASE ORGANIZATION

The case organization designs software for network protocol analyzers. One of the organization's sites in Finland started their agile transformation with pilots during the spring of 2010. They further changed that site's organization of around 30 employees to an agile way of working in the beginning of fall of the same year by starting to follow the methods of Scrum development [2][14]. During 2011, after initial results and experiences in Finland, similar processes were taken in use at a development unit in India and were planned to be taken in use in other sites as well.

The *Lean and Agile Deployment Survey* was conducted twice in the organization. The first survey took place about 6 months after the agile methods had been adopted in Finland. The second survey was conducted 12 months later and was expanded to include the site in India, which had adopted similar agile practices during that time.

The targets of the survey assessment were i) to review the current status of agile adoption at two of the case organization's sites, ii) to see how the unit in Finland had been progressing with agile methods between the two survey rounds, iii) to identify focus areas for continuous improvement efforts and iv) to receive feedback on the impressions and assumptions on agile and Scrum processes in other sites of the organization.

To obtain results for the last goal, the survey was also conducted in a third site, which had not yet fully adopted similar processes as the two case sites. The responses of the third site are omitted from the results presented in this publication.

The total number of respondents for the first round in Finland was 25. For the second round, there were 62 responses in total, 25 responses from Finland and 37 from India.

### V. RESULTS

The survey was very successful in terms of response rate, which was a full 100 percent in the first round and 80.5 percent in the second round. The high response rate was

attributed to the close collaboration between the case organization and researchers and extensive communication to the survey participants. Personnel of the case organization also sponsored the survey noticeably, so it was well received.

TABLE I. RESPONDENT EXPERIENCE

	How many years of experience in software industry do you have?			
	Round 1 (Finland)	Round 2 (Finland)	Round 2 (India)	Round 2 (Total)
None	0	0	0	0
Less than 2	1	0	6	6
2-5	4	2	13	15
5-10	5	5	16	21
10-20	13	16	2	18
More than 20	2	2	0	2
Total	25	25	37	62

A comparison of the respondents' experience shows that the personnel that participated in the survey were generally very experienced in software development (see Table I). There is also some difference between the experiences between the two sites. Many respondents in Finland had over a decade of experience in software development, which may amount to some opinions reflected in the survey results. The amount of experience in the Indian site is somewhat lower than in Finland, but, overall, the people in both sites had enough experience on software development to answer the survey.

TABLE II. RESPONDENT ROLES

	Round 1 (Finland)	Round 2 (Finland)	Round 2 (India)	Round 2 (Total)
Developer	13	16	18	34
Tester	4	1	10	11
Product owner	4	4	2	6
Scrum master	3	2	6	8
Other	1	2	1	3
Total	25	25	37	62

Most of the responses in the survey came from developers and testers (see Table II). The other roles with significant number of responses were the product owner and Scrum master. As the focus of the survey was at the implementation of agile development process, the responses from these roles also provides a solid basis for the analysis of the results. The other roles that the respondents identified with were individual manager roles of the organization.

Because of the case organization's preference, the statements were evaluated by the respondents on a four-

point scale, with an additional option of 'I don't know' instead of a 5-point Likert-type scale [23] usually utilized with the *Lean and Agile Deployment Survey*. The answering options with corresponding weights used in average calculation in the following results section were as follows (see Table III).

TABLE III. SURVEY ANSWERING OPTIONS

Option	Option weight
Disagree	1
Partially agree	2
Largely Agree	3
Fully Agree	4
I don't know	-

The following tables and figures present selected findings from the survey, which may be interesting in the context of multi-site agile adoption. The results for individual statements (see Figures 1-10) are presented as the distribution of responses and an average result in the statements in four separate rows. The first row presents the results received in the first survey that was conducted around 6 months after the agile adoption had taken place in the Finnish unit. The second and third rows include responses 12 months later from the Finnish and Indian units, respectively. The final row shows the combined answers in the second survey round from both sites (Finland and India).

Please note that the 'I don't know' –answers are not included in the average calculations. However, in some statements the amount of 'I don't know' –responses itself is significant.

Firstly, a very interesting finding can be made by looking at the collective average of the overall responses between the two survey rounds (see Table IV).

TABLE IV. SURVEY AVERAGE

	Round 1 (Finland)	Round 2 (Finland)	Round 2 (India)	Round 2 (Total)
Response average	3,04	2,76	3,28	3,07

The fact that the average score in Finland in the second survey is lower than 12 months earlier is an alerting sign, as the statements were formed in a positive form in accordance with the case organization's process description (i.e., respondent's agreement with a statement would imply that the respondent feels that processes are followed as described). There was some indication from the case organization that they had not had sufficient resources to actively react to issues raised in the first survey and subsequent retrospectives during the 12 month period between the two surveys. One possible cause for the reduction in the average results may also be increased experience and awareness of the agile methods. This could

affect the results as people became more aware of their processes and the issues concerning them than before.

Perhaps surprisingly, the average score in India was much higher than it was in Finland as seen in the second round average scores. Several reasons may affect this difference, with cultural reasons perhaps being the most obvious explanation. The results of the first survey were also higher in Finland, although not as high as in Indian site's first respective survey. Naturally, lessons learned from implementing the practices in Finland first could have improved the implementation in India, which would yield more positive results in the latter implementation.

Reasons for the drop in score are evident in some survey results. One main improvement area for the case organization based on the first survey was the lack of identified value of continuous improvement activities (see Figures 1 and 2). Figure 1 shows how the respondents feel about the results of retrospectives. In the first survey round in Finland, it was identified that although the general view on retrospective results was positive, not all respondents felt that the teams were actually changing their ways of working based on retrospectives. The results of the same statement year after the first survey show actually even lower results, with none of the respondent's fully agreeing with this statement. There is also a small drop in the Finnish site's results on the statement "we reduce wasteful activities frequently" in the second survey round (see Figure 2). At the same time, the majority of Indian respondents show that the same practices are working well in their site.

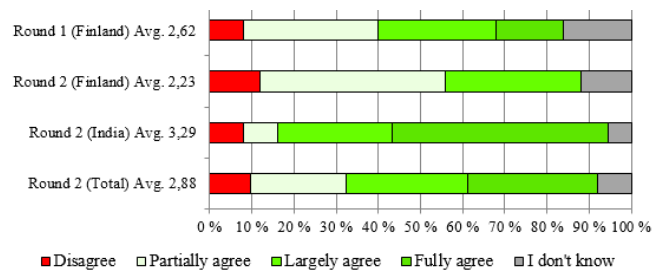


Figure 1. Scrum teams change their ways of working based on retrospectives.

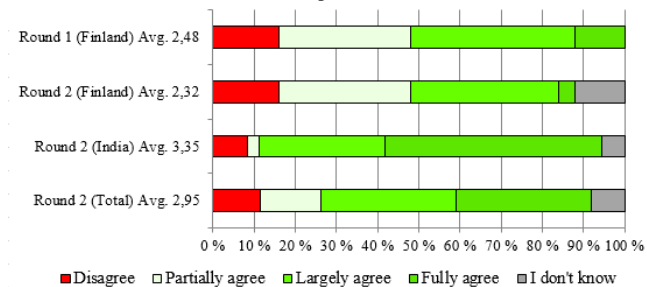


Figure 2. We reduce wasteful activities frequently.

The lack of resources assigned for following up on this improvement area show as reduced results in the topic of improving working practices. The results on continuous

improvement are significantly higher in the Indian site with results averages being much higher.

A second major improvement area identified based on the first survey round was the lack of measured and communicated evidence of the benefits of the agile methods for the organization. This included the measuring and communication of benefits in productivity (see Figures 3 and 4), product quality (see Figure 5) and development time (see Figure 6).

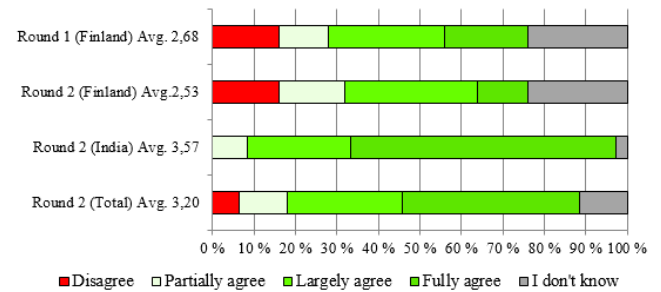


Figure 3. I am more productive with the agile way of working.

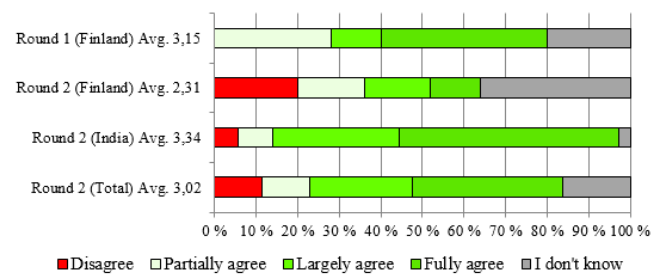


Figure 4. We are more productive as a Scrum team.

In the first survey round in Finland, it was evident that there were at least some differences of opinion in individual productivity between previous waterfall type of development and newly introduced agile methods (see top of Figure 3). There were also respondents who were unaware of any productivity changes related to their individual performance. Surprisingly, there were no disagreeing opinions on the productivity increase for the entire team even though some felt that their individual performance had decreased at the same time. This would imply that even if some individuals were not convinced of increases to their individual productivity, they felt that as a team their performance had still improved. Even if this was the case in the first survey round in Finland, in the second survey round the results had also dropped dramatically in terms of team productivity.

Again the results in this topic appear very high in India in relation to Finland. Especially in individual productivity (see Figure 3), the responses in India are overwhelmingly positive. Similar trend is evident also in the results of team productivity.

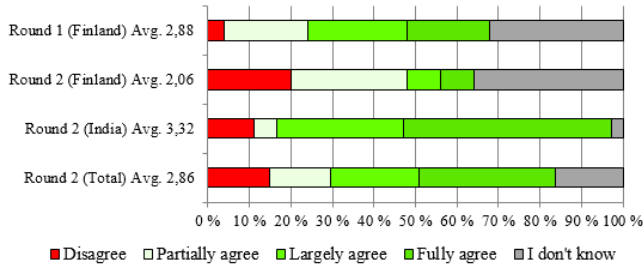


Figure 5. Product quality has been improved by applying agile development.

In Finland, similar trends are seen in the results of perceived improvements in product quality as in performance (see Figure 5). There are a lot of ‘I don’t know’ responses in Finland in the statement “Product quality has been improved by applying agile development”. This was the case in both survey rounds, but the results average in this statement also decreased between the survey rounds similarly to the previous statements about productivity. In India, the results are not as positive in terms of quality as they are in productivity, although the results are again much higher than they are in Finland.

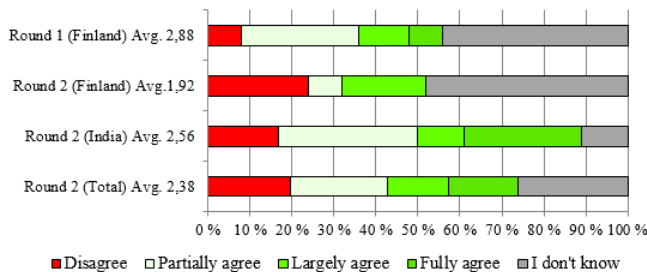


Figure 6. Development time has decreased by applying agile development.

Similar trends as with productivity and product quality changes are evident in yet another topic on development time (see Figure 6). In the first survey round, there was a lot of ‘I don’t know’ responses to the statement ‘Development time has decreased by applying agile development’. This was also the case in the second survey round, but many respondents also plainly disagreed with this statement. Actually, in the second survey round, only a handful of people showed any level of agreement to this statement and most of the respondents either disagreed with the statement or did not answer to it.

In India, there were also some ‘I don’t know’ responses and disagreement with the above statement. However, a majority agreed with the statement saying that the development time has actually decreased with the introduction of agile methods.

An action point after the first survey round was to provide the teams more information on the benefits of agile in comparison to earlier working methods. This issue had

apparently not received enough attention because the second survey round indicated some decrease in all results on the matter as well as an increase in ‘I don’t know’ –responses in Finland. Another possibility for the results is that the quality and productivity have actually not been improved with the new methods. The measuring of the benefits of agile is a very interesting and difficult topic among all organizations implementing the methods, but high consideration should be used on how to provide teams more information on actual benefits of agile.

Other findings of the survey showed that there were also possible needs for further training within the organization (see Figures 7 and 8).

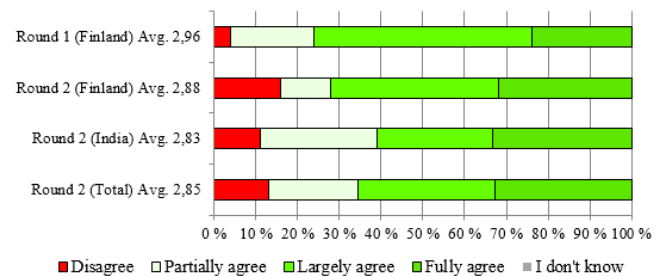


Figure 7. I have received enough training for carrying out my work.

In the responses of individual competence, there were small disagreement with the statement ‘I have received enough training for carrying out my work. Even though most of respondents appear to be satisfied with their training, it may be interesting to note that the results in Finland dropped between the two survey rounds to include more respondents disagreeing with this statement. As the nature of the work during the 12 months between the surveys did not change, this may be indication of “conscious incompetence”, where people become more aware of their own needs for more training with time. In contrast to the other findings, in this particular statement there were no major differences in the responses between Finland and India.

Even though there were no significant differences in the statement about training needs, there were some differences between the sites in terms of individuals feeling confident about themselves with the agile way of working (see Figure 8). In the first survey round in Finland, nearly all respondents largely or fully agreed with the statement ‘I feel confident with myself with the agile way of working’. In the second survey round, the results in this statement had dropped significantly even though the methods had been in use longer and, therefore, should be more familiar to the respondents. In India, the distribution of responses appear to be very similar than in Finland in its respective first round. The respondents in India feel very confident with themselves with the new working methods.



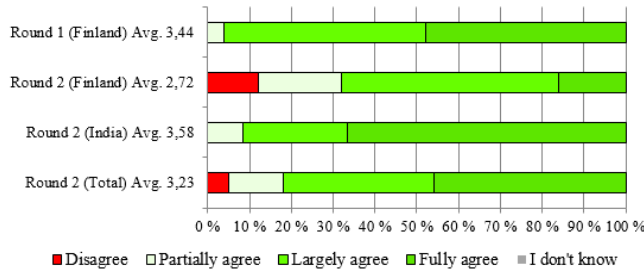


Figure 8. I feel confident with myself with the agile way of working.

When comparing the results between the sites in Finland and India, it can be seen that the training needs appear to be equally divided between the two sites. However, there is a noticeable difference between the sites in the confidence in individual capabilities. One possible explanation for this can be cultural differences in answering the survey, but as the results appear similar in both sites with their respective first implementation of the survey, this could imply that the results will reduce with time.

Perhaps the most compelling evidence of bias in the survey results is evident in statements about the preference of team co-location between the sites (see Figures 9 and 10). There is a very noticeable difference in the answers between Finland and India.

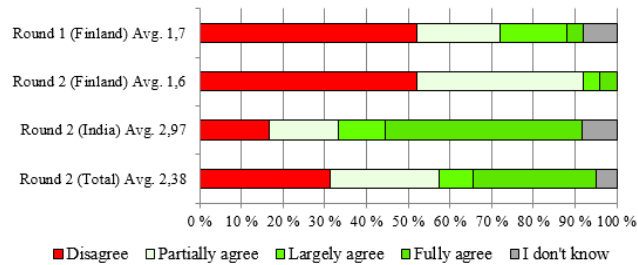


Figure 9. I prefer to work in a multisite Scrum team.

When asked about the preference of working in a multisite Scrum team (see Figure 9), the results in Finland remain similar between the two survey rounds. Most of the respondents disagree with the statement ‘I prefer to work in a multisite Scrum team’, and there are only individual respondents fully or largely agreeing with the statement. In the second survey round, the results have reduced even more with most of the agreeing responses being now only in the ‘partially agree’ –response. In India, the results in the same statement appear somewhat different with almost half of the respondents fully agreeing with this statement. There are also some disagreeing opinions to the statement and individual ‘I don’t know’ –responses.

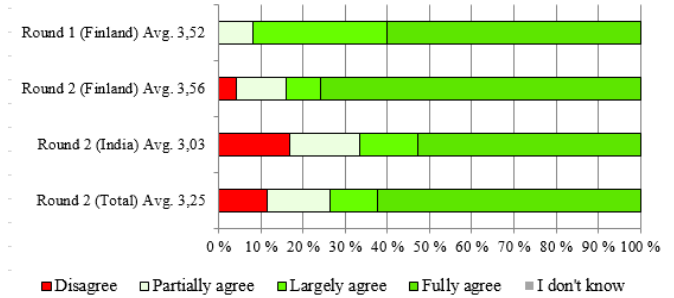


Figure 10. I prefer to work in a local Scrum team.

When asked about the preference of location the other way around, the responses show distinctive differences between the two sites (see Figure 10). In the statement ‘I prefer to work in a local Scrum team’, the responses in Finland appear to be very parallel to the previous statement on preferring to work in a multisite Scrum team as expected. This was the case in both survey rounds, and the amount of ‘fully agreeing’ responses to this statement formed the clear majority.

On the contrary, in India the responses to this statement of local Scrum team preference were not parallel to the previous statement, or actually anywhere near it. The responses were mostly agreeing in both statements of team location preference, which in nature should be contrary with each other. The distribution of responses between these two statements is also very similar, with most respondents ‘fully agreeing’ in both statements.

Differing from the answers in India, there seems to be a clear preference to co-location of team members in Finland. The co-location in generally viewed as an important part in Scrum processes and the results in Finland show the preference that has come by experience in that site. The conflictingly high results of India in both of the two above tables may involve cultural influences, but also some lack of experience since the agile methods had been in use there for a shorter period of time.

It should be noted that the statements on team location preference (Figures 9 and 10) were asked next to each other. During the analysis, the results of these two statements also raised the question of whether some respondents did not bother reading the survey statements at all. The validity of these responses was ensured by looking at individual response sheets and there was no evidence of individuals not filling the survey purposefully.

Although generalizing a large set of survey statements may be problematic, an additional interesting comparison was made between the two survey rounds in the overall amount of ‘I don’t know’ –answers (see Table V).

TABLE V. PERCENTAGE OF 'I DON'T KNOW' RESPONSES IN ALL STATEMENTS

Round 1 (Finland)	Round 2 (Finland)	Round 2 (India)	Round 2 (Total)
9,8%	12,7%	7,62 %	9,8%

In the second survey round, the amount of 'I don't know' -answers in Finland is quite a lot higher than in India. When results between the two rounds are compared, we find that the percentage in Finland has increased between the two rounds and that the percentage in India is even lower than in Finland in the first round. There was a similar amount of time elapsed from the agile adoption in Finland in the first round and India in the second. This could indicate that the amount of knowledge acquired during the 12 months between the survey rounds in Finland had lead to an increase in awareness over issues.

This can also be an indication of the cultural differences in the two locations. The total percentage of 'I don't know' -responses appeared to be identical between the two survey rounds at first, but the difference in the amount between the two sites is a clear indication that this type of analysis should be done to get a comprehensive image of survey results.

## VI. DISCUSSION

Generally speaking, the case organization was pleased with the results obtained by the adoption of agile methods in their development process. They felt that agile methods had increased communication and predictability of their software processes, even if there had been some difficulties in the adoption. The results highlighted in this publication did not diminish the organization's commitment to the agile methods and the survey results were openly communicated throughout the assessed organizational units.

Based on the survey results, the main improvement areas identified in the first survey round were not given enough attention after conducting the survey. This was also admitted by the case organization because of reduced resources for the improvement efforts. This is one of the main reasons why the results in the Finnish site appear lower in the second round.

As an organization commits itself to new working methods, it also has to show and communicate this commitment. In this case organization, there was a clear lack of resources for improving the newly introduced methods, which shows as apparent lack of commitment from the employees as well as time passed. If an organization does not provide sufficient resources for change management and addressing possible issues that arise from organizational changes, the employees may lose confidence in the changes and start reverting to old working methods.

Another main reason for the reduction in response averages in some statements is believed to be increased awareness on the topic of agile methods and possible issues related to them. The combined average result in all

statements between Finland in round 1 and India in round 2 are similar. The amount of time that these two sites had been using the agile development methods before their first respective survey rounds was also similar. This would indicate that as the adoption methods of the case organization were similar in the two sites, the results of the working practices appear to be the same in the beginning of the adoption for the most part. However, the increase in the amount of 'I don't know' -responses in Finland over time may be indicative of increased awareness of the process and that it is not followed as it should.

Based on the first survey results, the first important improvement suggestion for the case organization was to improve the resources currently utilized for change management and improvement efforts. It was suggested that the teams may need more support and resources for successful organizational transformation. The reduction in the results related to improvement efforts (see Figures 1 and 2) shows that these suggestions were not followed sufficiently.

The same suggestion was given to the case organization after the second survey round as well. It was noted that the reduction in the results regarding improvement efforts must be given higher priority in both sites. In Finland, more resources were to be made available to start addressing possible issues with the new working methods to ensure that the employees will stay committed to the changes. In India, same resources should be made available to prevent a similar reduction in the results, if possible. It may be that the previously mentioned notion of increased awareness and subsequent reduction of results will become evident anyway. However, this should not diminish the importance of the organization communicating its commitment to the organizational changes.

The increased resources should include both support for continuous improvement activities and especially the follow up of these activities, since there were no definitive improvements that could be identified from the first assessment round.

The identified decrease in results should be taken seriously to see what kind of improvement actions could be taken. This should also include very active participation from all members of the development organization, since they will be most aware of the issues regarding their daily work. The practices and processes that do not work should be adapted according to the organization- or unit-specific preferences while remembering to include the agile principles and mindset.

Continuous improvement activities should have a strict process to follow, which includes communication to all interested stakeholders on the progress of the activities and responsible individuals who have allocated time to conduct the activity. [24] has also presented evidence of additional success factors that can support the sustainability of improvement activities as well, which should be kept in mind when implementing changes.



The follow-up of the activities should also include a larger scale follow-up of the adoption of agile methods. Some forms of quantitative or qualitative measurements of the possible benefits of agile (in productivity, quality, etc.) should be measured and communicated in all units, including the sites that may take the agile methods into use in the future. This shows that the organization is committed to the changes and that the activities that are requested of the members of the organization have justifications behind them. There was already some evidence of doubt in the agile methods in the first survey round and these doubts should be addressed properly through discussion.

Measuring the benefits of organizational or process changes can be difficult, especially if these kinds of metrics are not introduced before the changes. The adoption of organizational changes will still have some motivation, and that motivation needs to be assessed after the changes have been done in order to make sure that the changes have been valid.

In addition to the assessment results changing with time elapsed between the organizational change and the assessment, the results of the survey also indicate bias in the results based on cultural differences. When assessing the success of multisite organizational changes, it should be noted that the results may vary between locations for reasons that may not be possible to influence with any change management processes. Therefore, it may be useful in some cases to assess different global sites individually, instead of comparing the results of sites between each other.

The cultural differences in this article have been identified on a national level. The differences can be also found on other levels of the organization as well. Differences between working cultures also appear on individual and team levels, and no individuals should be categorized only based on their nationality or other characteristic. However, based on this survey, there are cultural characteristics, which need to be taken into account when assessing organizational changes. Any assessment effort related to organizational changes should be made with the notion that there may be underlying differences between nationalities, sites, organizational levels or working cultures.

## VII. CONCLUSION

The managerial implication of this study is the importance of providing resources for following up on continuous improvement activities when they are expected from the employees. If resources are not available for removing issues or attention is not given to the improvement tasks, employees may also start losing confidence in organizational changes. The other managerial implication is the high importance of measuring and communication of the benefits of organizational changes. Without clear communication about the possible benefits of organizational changes, employees will start to doubt their significance, which will hinder further improvement efforts as well.

Scientific implications of this study is the importance of taking cultural factors into consideration when analyzing research results. The evidence on the influence of cultural factors does is not limited to assessments such as [21], but also maturity models such as [20]. Cultural influences may cause issues in comparison between research results.

The results of this research can be used by researchers and practitioners when assessing organizational changes. Assessment results between geographically distributed sites may not always be directly comparable between each other. Cultural differences in results and the difference in elapsed time from the organizational change may also affect assessment results and should be noted when analyzing data.

It would also be beneficial to compare results of a similar assessment with a different scaling method like, e.g., the Likert-type scale. The scaling itself should not be a contributing factor in this study, but additional assessment cases with similar backgrounds could be used to validate the influence of the used survey scale.

The assessment process could be repeated in the case organization for a third time to analyze further progress of the organizational change. The findings of this assessment were used to focus future improvement efforts in the case organization and to provide feedback on how they understand their agile transformation so far. The results were presented to all participants through an open discussion session by the researchers and a written report was communicated openly inside the organization. The report was also brought into general knowledge by giving access to it within the organization.

The findings of this study related to cultural influences affecting assessment results should also be validated in other assessments. The results should be applicable in other types of assessments as well, but this would need further validation of the results.

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