Themes and Difficulties in Distributed Agile Email Activity: A Qualititative Team-Based Study

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ABSTRACT

In a previous study by Niinimaki, the main use of emails in a distributed setting was found to be for sending non-urgent, group-wide information. In this paper, we delve deeper into this question and examine interview text from seven industrial development staff in a distributed agile setting to explore the underlying rationale for using email. Exploring communication and co-ordination patterns between teams was the chief motivation for the interviews and study. Results showed that while, in some cases, email was indeed used for team-wide communication (in support of the earlier work) a number of other uses and a set of email 'themes' emerged. We examine these themes and compare them with a set of fourteen communication difficulties associated with GSD listed by Monasor and detailed in a Systematic Literature Review. Preliminary findings from our study suggest further that email reflects a *microcosm* of many of the listed difficulties, but only for half of the total. The over-arching conclusion is that, while email might be perceived as relatively unimportant to GSD activity, it is often symptomatic of larger (and recognized) issues and challenges often underpinned by the personalities involved.

CCS CONCEPTS

• Software and its engineering • Software notation and tools • Software creation and management

KEYWORDS

Email, interviews, qualitative, distributed, agile.

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1 Introduction

In the past fifteen years, the use of Global Software Development (GSD) practices has grown significantly, reflecting modern-day industrial development practice [1, 5, 7]. While GSD brings many benefits, it also brings challenges associated with time zone differences, effective communication, problem resolution and trust issues, to name a few [2, 6, 10, 11, 16, 17]. One of the key tenets of GSD is effective communication and, while with today's technology we would imagine that email is marginalized in the overall development process, evidence suggests the opposite to be the case.

The work in this paper contrasts with previous work by Niinimaki [14], where the prime motivation for using email was found to be a group-wide dissemination mechanism. We used the text of interviews with seven members of a team based in a city of the EU (inserted to protect anonymity) which collaborated and coordinated on activities with a team in India. In contrast to the study by Niinimaki, our analysis found six "themes" for using email (i.e., sharing of knowledge, time-zone centered, conflict and misunderstanding, aversion to email communication, version management and motivational use). We illustrate these themes with direct interview text quotes. We also draw on the systematic literature review (SLR) work of Monasor [12] who listed a set of fourteen "Difficulties" associated with GSD communication and we map where, in the interview text, these difficulties surfaced. Interestingly, many of the six themes mapped to disjoint Difficulties identified by Monasor. The over-riding message of this preliminary research is that much of the email activity, far from being simply to disseminate information, represents a microcosm of many of the difficulties that GSD suffers from.

The remainder of the paper is arranged as follows. In the next section, we describe background to the work and why we feel that the topic deserves study. In Section 3, we provide analysis of our data and the themes in the data extracted from the data. In Section 4, we map those themes to the difficulties identified by Monasor before concluding in Section 5.

2 Background and motivation

The interview text is based on the work of seven development staff of an international bank and financial services company. The headquarters of the bank are in a major city of the EU and it has distributed business centers and IT centers across the globe. The bank has set up centers in India, where a number of teams work; all employees belong to the one organization. The interview questions were formulated beforehand by one of the authors and each interview (conducted by the same author) lasted approximately one hour; however, a large degree of flexibility was incorporated to allow the interviewer to pursue relevant issues arising during the interview and to allow open-ended answers from the interviewees. The interview protocol thus enabled consistency in the data collection while lending a level of reliability to the results. The interviews focused on the following two areas: a) sharing processes and practices relating to team coordination and collaboration in both locations relating to communication, b) knowledge within both teams and the continuing challenges the team was facing. The interviews were recorded and then transcribed fully afterwards and it is from that transcribed text that the contents of this paper are drawn. The teams within the bank adopted the tenets of XP with TDD from the start of the project which provided them with a basis of structure in defining and adapting the agile processes. The essential practices of XP of pair programming, iterative development, little upfront design, unit testing and continuous integration were applied with varying degrees. The team in the EU comprised four developers (Developer 1-4), one Test Manager, one Business Analyst and one Scrum Master. All ethical procedures were authorized before the interviews took place. An interesting side-note to the use of technologies is that the video-conferencing technology used in the company was often abandoned because of the poor and frequent loss of connection. This may have led to a greater dependence on phone calls, instant messenger and, of course, email and this is one inspiration for the work in this paper.

In terms of further motivation for our work, there has been a wide range of literature published on GSD in the past few years and the challenges that presents in terms of its effectiveness [4, 13, 15, 18]. In particular, the work is motivated by a previous study by Niinimaki [14], where face-to-face, email and instant messaging (IM) communication in a distributed agile software development team was described. The team had 13 members distributed between three different sites in Finland, Norway and Czech Republic. From the analysis, email seemed to be more suitable for team-wide, inter-site communication (i.e., for non-urgent distribution) than face-to-face or for IM. The research also draws inspiration from the SLR developed by Monasor [12] and the set of fourteen Difficulties associated with communication in GSD. In terms of communication problems brought about by GSD and to illustrate the scale of the problem that this paper explores, a study by Komi-Sirvio et al., [8] reported that 74% of problems in distributed projects were caused by communication issues.

1.1 Monasor's difficulties

Monasor presents a list of communication problems or "Difficulties" (as we will refer to them) relevant to GSD. The purpose of Monasor's work was to: '*permit researchers, instructors and practitioners to discover the main challenges, strategies and proposals available up to the present day*'. The goal discussed was that, in the context of challenges brought by GSD, students and software engineers must acquire the skills to confront the challenges which are not part of their conventional curriculum.

According to Monasor: "*In GSD projects, the use of a variety of communication media such as email, instant messages, telephone or teleconferences is the rule. There is growing empirical evidence that personality factors impact upon team performance. It has been found that participants with poor language skills tend to prefer using text-based communication media as opposed to ad hoc video conferencing. Virtual teams interacting in GSD environments therefore tackle complex difficulties* [see D1-D14 below] *that are not the rule in traditional co-located environments*". The study goes on to say: "I*t is therefore necessary for software engineers to have additional technical skills as regards using the collaborative tools available in the field of* [software development]". The set of difficulties suggested by Monasor D1-D14 are listed in Table 1 *verbatim* from [12].

Table 1: Difficulties identified by Monasor [12]

Diff.	Description
D1	Interaction with multi-cultural and multi-lingual members.
D2	Interaction with multi-disciplinary teams.
D3	Use of different dialects of the same language: different spelling, accent and use and meaning of words.
D4	Use of different standards and terminology.
D5	Misunderstandings and high response times.
D6	Fewer opportunities for communication. Loss of non-verbal cues and limited informal communications and, in consequence, inequality of participation.
D7	Difficulty in building up consensus, trust and team awareness with the consequence that it takes longer to reach decisions.
D8	Less cohesiveness of the team. Difficulty in sharing of Ideas, artifacts or components needed during the process.
D9	Conflicts among locations and difficulty in reaching agreements.
D10	Negative impact of fear of interacting with virtual teams. As a consequence of the conflicts that are inherence to this kind of development.
D11	Lack of trust in other team members. The addition of distance makes it more difficult to establish reciprocal faith in others' intention and behavior.
D12	Feelings of isolation and indifference in virtual teams.
D13	Use of communication and collaboration technologies which require time to be learnt.
D14	Failures in communication. When senders of an email expect a response, but the received does not consider it necessary to respond, which may led to time loss and lack of trust.

To undertake the analysis, all the text of interviews was screened for the word 'email' and the relevant text surrounding it then analyzed. In the next section, we analyze the interview text from the seven members of the team related to that extracted text and assign, where possible, each of the 14 difficulties to that snippet of interview text. We assume that, in each theme, D1 and D2 always play a role, since emails in the case-study were sent between teams and within teams (EU and India) and hence we omit D1 and D2 from the assignment process. In all email communications listed in the next section, we assume shared processes and projects between EU and India teams.

3 Data analysis

3.1 Theme 1: Sharing of knowledge

Significant evidence of email as a sharing mechanism was found in support of the study by Niinimaki. For example, in response to the question: "How do you help share information and understanding between the two teams", a range of responses was received: "*The occasional email exchange*" was one response (Developer 2). "*We used to send emails to the entire development team... there are still emails going around the whole team informing* [everyone] *about things*" was another. Also: "*if you have some more information to share, send an email and then nobody is being ignored'*. Finally: "*If we have something to broadcast to the whole team we can always send an email*". In response to the question: "Do you feel that there are difficulties or challenges to be ironed out [with the effective exchange of knowledge]?" One Developer (1) responded: "*At the end of my work, if I have something to communicate with everyone in the team then I will send them an email, but that won't happen on a day to day basis*". For the Business Analyst (BA), a solution to a specific problem was found and communicated over email: "*.....but a lot of times it* [solving the problem] *will be left to me and I'll figure it out and send them all* [the team] *an email and say look this is what happened and this is how you figure out what's happened and the steps you have to go through*" [D8]. Sharing the solution to a problem can also be problematic. The BA goes on to say: "*.....I'll send the email out and the next week they'll be asking exactly the same question....the same person asking the same question about four times is a bit of a waste of my time and then I have a habit of sending sarcastic emails and not everybody appreciates it*" [D8].

3.2 Theme 2: Time-zone centered emails

There was also evidence that the time zone differences influenced the choice of email *vis-à-vis* other forms of communication. For example, in response to the same question "How do you help share information and understanding between the two teams?" one developer responds: "*A lot of time IM and if it's after hours tend to write an email or something like that*" [D5] (Developer 3). In response to the question: "How often do you collaborate with a member of the other team?" The same developer answers: "*Hopefully the time zones are overlapping when you have this problem but otherwise you obviously have to send an email or you wait and those waits kill you.....it's obviously better if turnaround can be five minutes rather than 24 hours"* [D5]. In response to the same question: *"I'd probably go more for email and that's partly because during that overlapping time I'm actually responding to existing queries so existing email threads are waiting for me when I come in. I often send an email and then they will reply to it during their day and then I get the response and then we'll bounce backwards and forwards*" [D6] (Developer 2). The Scrum Master writes: "*.....our days only overlap partially so you're just left with the email". We really try to maximise the exchange of information during that part of the day when we overlap*" [D5]. The BA states: "*.....we've not done any proper pairing on stuff. It's quite difficult when they're* [the distributed team] *are not there. I mean we might talk on the phone and on the chat programs we've got and email but that's about all you can do really*" [D6].

3.3 Theme 3: Conflict and misunderstanding

As well as the two former themes, a number of emails were found to be either the source of frustration or as a mechanism for resolving 'political, office-based' problems. For example, one developer, in response to a question about fostering relationships between teams (in the EU and India) saw email as a way of avoiding communication: *"There's a level of tension there which I have with a couple of people...I know* [a couple of] *developers who will set up a demo* [and then] *try to get out of it. And sometimes they get away with it by sending an email and then I can't do anything about it*" [D9]. From the same developer: "*....there are certain individuals who think that they can fire off and email and forget about it*" [D9] (Test Manager). On the question of communication methods, the same member of staff states: "*I tend to pick up the phone to discuss a problem and then document the solution and then say this is what we agreed. I get irritated* [by people] *who basically use email as a means of trying to ask questions when they could actually pick up the phone*" [D9].

On seeking clarification of a story's detail from a fellow team member when ambiguous, Developer 2 makes the point: "*It's not really clear in an email that they've answered the question as to what needs to be done. I have a feeling that a conversation will solve it and I will arrange a conversation some morning and bring people in...*" [D9]. The same developer goes on to say: "*I tend to do a lot of things as emails to see what the response is and then I will bring that email up again later if we still feel the pain that yielded the email*" [D11].

On the question of shortcomings in a developer's code, the treatment is often through email: "*There are a few passive aggressive emails occasionally. I think it depends on whether who we are talking about realises that there is a shortcoming*" [D11] (Developer 2). On the topic of information exchange (with Quality Assurance) taking the time zone difference (between India and EU) into account: "*And so there are those communications and when the QAs find issues we use a mixture of email and IM conversations* [to sort the problem out]" [D5] (Scrum Master). Some doubt was also cast on whether the tone of emails and the way the email had been expressed led to miscommunication: "*If you lose the intonation and do it in an email it's difficult to do. When you read it back, you realise that it was quite critical*" [D5] (Developer 3).

3.4 Theme 4: Aversion to email communication

Many of the development staff expressed reservations about the use of email, vis-a-vis other forms of communication. For example, on the subject of coordinating activities and getting work done: "*Most of the time we do it* [co-ordinate activities] *through phone, but I always prefer on the phone than chatting and then email*" (Developer 1) [D6]. In terms of knowledge exchange, the same developer states that: "*we went to India on a rotation basis ...it was very effective.....sitting with them for 8 hours and that is the best way to share information pairing rather than sending emails or talking over the phone*" [D6] (Developer 1). Another Developer (4) suggests that: "*Phone calls are good if the person is around. I would prefer to firstly get out of my chair and go and talk to someone and secondly phone, thirdly use instant messaging and finally email*"

[D6]; Developer 3 states: "*Talking* [face-to-face] *is better than phone, which is slightly better than IM which is slightly better than email*" [D6]. In response to the question: "Do you feel you use different technologies in different situations?" Developer 4 argues: "*If it needs to be team-wise then you make a conference call - something less urgent you revert to an email or group chat"* [D6].

3.5 Theme 5: Version management

Use of email was also found to be part of the version management (VM) processes (and criticism of the processes surrounding VM) at the company. For example on the question of improving knowledge sharing: "*Even if we documented stuff nobody would ever read it. It's like when I've sent emails around* [stating] *this is the problem, this is the cause, this is how you figure out what it was and the same thing happens next week.....'cos they've not read the email*" [D8] (BA). In terms of task allocation, The Scrum Master states: "*I think if there's a bit of functionality that I'm interested in and the analysis is being done in India for instance* [with JIRA] *you can watch it and you will get an email if it changes*". Finally, in terms of story completion: "*I will finish a story, it will go into QAs hands.....and they'll post a reply on JIRA and then I'll get an email saying this JIRA has been added to*" (Developer 2). These last two quotes are not difficulties *per se* and show positive aspects of using a repository; as such, they could be considered a positive (p) angle on D13 (henceforward called D13p).

3.6 Theme 6: Motivational use

Some evidence was also found for email as a form of motivation and for nurturing team morale. In response to questions about team-building and diffusing tensions between teams all attributed to the Test Manage: "*I explicitly look for a job well done so that I can go and write an email copied to the bosses that goes something along the lines that that was a great piece of work. Well done*". And in terms of getting good news stories circulated: "*So of course I get onto the email.....and make sure it gets circulated and that gives X a pat on the back. You must be professionally robust in all your dealings with everyone and I actively encourage that and use* [that approach] *regularly in emails when I am geeing up the team*." Finally: *"...I thought this is a real example of best practice so I took that email and passed it onto the people*". As *per* the previous theme, these are not negative or difficult aspects of email and, as such, we see them as a positive angle on D7 (henceforward labeled D7p). They are a means through which trust (and confidence) within and across the teams can be nurtured.

4 Theme/Difficulty mapping

To further our analysis, we summarize the six themes (1-6) described in the previous section and cross-tabulate with the set of Difficulties; these are presented in Table 2 (where 'Th.' is Theme).

It is interesting that Theme 1 was exclusively associated with D8 (difficulty in sharing) and Theme 2 (time-zone differences) was associated exclusively with D5 and D6. Theme 3 (conflict and understanding) was associated exclusively with D5, D9 and D11. Theme 5 incorporates D8 (version management). In summary, only seven of the fourteen "Difficulties" appeared to be used in our allocation scheme. None of the themes embraced: D3, D4, D7, D10, D12, D13 or D14. Email text therefore illustrates many of the Difficulties that Monasor suggested were present in GSD communication but omits many also.

Table 2: Difficulties identified by Monasor against used email themes

Th.	Diff.	Description
1	[D1, D2, D8]	**D8**: Less cohesiveness of the team. Difficulty in sharing of ideas, artifacts or components needed during the process.
2	[D1, D2, D5, D6]	**D5:** Misunderstandings and high response times. **D6:** Fewer opportunities for communication. Loss of non-verbal cues and limited informal communications and, in consequence, inequality of participation.
3	[D1, D2, D5, D9, D11]	**D5:** Misunderstandings and high response times. **D9**: Conflicts among locations and difficulty in reaching agreements. **D11**: Lack of trust in other team members. The addition of distance makes it more difficult to establish reciprocal faith in others' intention and behaviour.
4	[D1, D2, D6]	See Theme 2 for D6 details.
5	[D1, D2, D8, D13p]	See Theme 1 for D8 details. **D13p:** Use of communication and collaboration technologies which require time to be learnt.
6	[D1, D2, D7p]	**D7p:** Difficulty in building up consensus, trust and team awareness with the consequence that it takes longer to reach decisions.

Table 3 lists the seven difficulties which did *not* figure in any of the six themes. For each, we provide a reason/suggestion as to why this might have been the case.

Table 3: Difficulties identified by Monasor against unused email themes

Diff.	Description
D3	Use of different dialects of the same language: different spelling, accent and use and meaning of words. **Suggestion: English was a common language.**
D4	Use of different standards and terminology. **Suggestion: Common to both sites.**
D7	Difficulty in building up consensus, trust and team awareness with the consequence that it takes longer to reach decisions. **Suggestion: No evidence of any difficulty found.**
D10	Negative impact of fear of interacting with virtual teams. As a consequence of the conflicts that are inherence to this kind of development. **Suggestion: Fear is not a trait of the systems we explored.**
D12	Feelings of isolation and indifference in virtual teams. **Suggestion: No evidence of feelings found.**
D13	Use of communication and collaboration technologies which require time to be learnt. **Suggestion: Learning tech. not a feature of team activity.**
D14	Failures in communication. When senders of an email expect a response, but the received does not consider it necessary to respond, which may led to time loss and lack of trust. **Suggestion: Too specific a circumstance.**

In terms of D3 and D4, English was a common language across both sites (EU and India) and standards and terminology were largely similar. There may well have been cultural differences, but these did not come across in any of the email text we analyzed. No evidence was found of difficulty in building up a consensus, trust and team awareness or any sentiments of 'fear' (and anxiousness) was found in the interview text [19] (D7). Frustration (and irritation) seems to be most prevalent feeling. We also found no evidence of feelings of isolation or indifference in any of the texts (D12). In terms of D13, many of the technologies were already known by the team and so no 'learning' as such needed to take place. In terms of D14, we found no evidence of this specific circumstance in the interview text. We also need to consider the threats to validity of the study. Firstly, we only used 7 development staff as part of the study and this limits the extent to which we can generalize the results. Secondly, we accept that we are only studying GSD through the prism of email and that there are many other interesting insights from a range of other GSD aspects. For example, in many of the interviews, the development staff expressed IM as a better and more effective tool; future work could explore the interplay between these two technologies. Thirdly, we have to consider the Hawthorne Effect [9]: people behave differently when they are being observed; perhaps the views of the interviewees were not their honest thoughts (especially since they knew that the research would be published). Finally, these are preliminary results and, as such, form the basis for further extended analysis.

5 Conclusions and further work

In this paper, we described a study based on interview text drawn from seven development staff in a team based in a city of the EU and communication and co-ordination with teams in India. The purpose of the study was to explore in depth the claim that the prime use of email in a distributed setting was for sharing non-urgent information [14]. We identified a number of recurring themes in the analyzed text (in contrast to the conclusion of that earlier work). These themes were developed with specific reference to, and analysis of, the interview text. A set of difficulties associated with GSD communications were attached to each theme. Interestingly, the mapping showed a strong disjointedness between themes and difficulties, suggesting that email may essentially be a microcosm of the many difficulties encountered in GSD generally. There are also implications for what we teach about agile as well. The analysis suggests that many of the social-science based subjects have as much to offer in our understanding of agile as from a technical standpoint. Perhaps sociology, psychology and other humanity-based subjects should be part of the agile curriculum as much as the more technical aspects of agile. In terms of further work, it was evident that personality and sentiment were key aspects of the text analysis. We could therefore carry our sentiment analysis on the text to establish negative or positive aspects of teams [3]; this could be achieved using a tool which quantitatively measure sentiment [20]. A larger (replication) study to see if the results scale-up is also something that would be worthwhile undertaking across the same application domain and others.

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