ISSUES OF COLLABORATION WITHIN GLOBAL PROJECT TEAMS

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ABSTRACT

The modern practice in design of products and services is typically highly collaborative in nature, and with shorter development cycles and global scale of modern commerce, this collaboration often spans multiple locations, countries, time-zones and cultures. Such distributed collaboration presents many challenges when compared to co-located design teams, even allowing for a proliferation of software and hardware products targeted to these needs. This paper reviews the issues involved and reports results from 2 case studies – one involving a large multi-national corporation, and the other involving 8 globally distributed student design teams. Inferences are drawn from the literature, and findings from the two case studies are compared to identify likely trends in global collaboration tools for product design.

KEYWORDS: Global Collaboration, Case Study Research, Serendipity

1. INTRODUCTION

Remote collaboration within globally distributed teams is becoming an increasingly common requirement within modern companies and organisations. This can be credited to the inherent advantages of globalisation [1], [2] and by the increasing adoption of modern communication technologies. By definition, collaboration is recursive process which includes *"exchanging information, altering activities, sharing resources, and enhancing the capacity of another for mutual benefit and to achieve a common purpose."* [3] While this is typically quite straight forward for co-located teams, difficulties begin to arise when global teams attempt to collaborate on a project. For example, simple methods used by local teams for problem solving such as brainstorming, developing/drawing out ideas, impromptu meetings and casual interactions become much more difficult when part of the team is located at another location. This was highlighted by researchers Kraut, Egido, and Galegher, who studied the likelihood of collaboration between 164 scientists and engineers based on each pair's organisational proximity, research similarity, and physical distance [4].

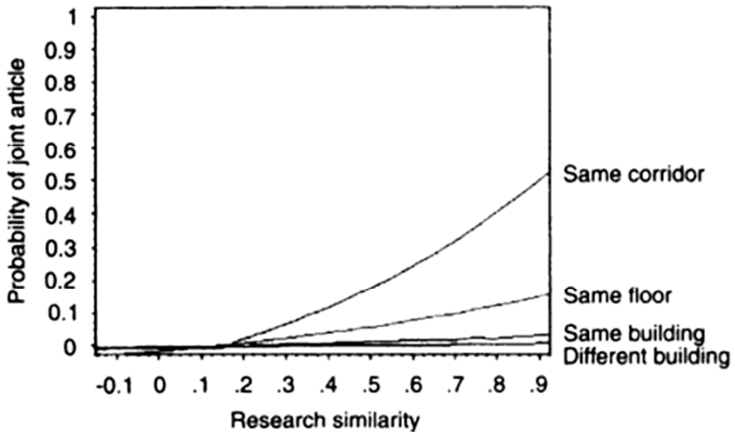


Figure 1.1: Association of research similarity and probability of collaboration at different levels of physical proximity [4]

In this paper, the problems experienced during remote collaboration will be reviewed and explored with specific reference to currently available software/hardware 'solutions' (Section 2). A case study will then be presented in Section 3 which reviews remote collaboration within the SAP AppHaus, Dublin. Finally, Section 4 will outline and analyse the results of a survey conducted on students partaking in a globally distributed design course at Stanford University (ME310).

2. CURRENT PROBLEMS WITH REMOTE COLLABORATION

Study of remote collaboration has led to the discovery of a number of constraints and limitations which currently hinder effective collaboration within remote teams. Without face-to-face interactions, it becomes difficult for remote teams to effectively manage roles and responsibilities and to develop a good working relationship within the group [5].

During conventional (i.e. co-located) communication/collaboration eye-to-eye contact, body language, and human interaction play a significant role and it is likely therefore that these capabilities should ideally be seamlessly incorporated within remote collaboration systems [6, 7]. A spectrum of current remote collaboration systems is presented in Figure 2.1, which shows how each system fares in terms of sharing information, supporting natural conversation, and immersing the remote user [6].

Maintaining eye-to-eye contact is important during conversation as it connects the speaker and listener, allowing for a greater understanding between the two and a more successful message conveyance [7]. Video conferencing tools such as Skype have strived to achieved this, but currently can only achieve one-on-one conversations where both parties remain statically within the camera's field of view. Some of the more advanced systems (Figure 2.1), such as telepresence systems, allow for group video conferences but have struggled with allignment issues to ensure that everyone in the room can make eye contact with all remote team members.

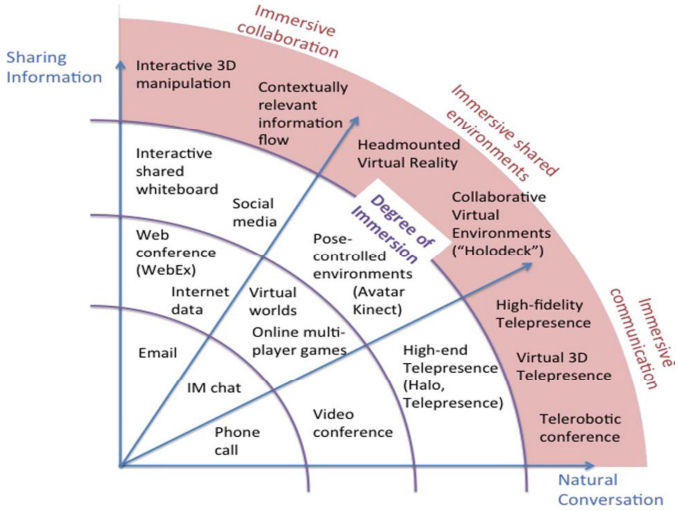


Figure 2.1: Communication and collaboration tools [6]

Similar to eye-to-eye contact, body language is a fundamental requirement for successful communication and collaboration between individuals. The use of body language helps to convey information and emotions to the listener, giving a good indication of the speaker's current state of mind. The term "digital body language" has been given to attempts which try to achieve this over a digital medium. However this has been difficult to translate due to the many uncertainties of meetings; such as the number of people present at each meeting, their movement throughout the meeting, and their position within the meeting room. This makes it inherently difficult for each individual's body language to be fully captured and displayed using digital devices due to their limited field of view. As a result of this, many remote communication/collaboration tools either omit or limit the conveyance of body language (all sectors close to origin of Figure 2.1).

Related to body language, other simple interactions between team members such as the ability to interrupt, the ability to get your point across, and the casual exchanges of information can all be limited when using remote collaboration systems.

Unlike local collaboration, where impromptu meetings can be simply arranged, remote meetings within companies typically require more significant planning and scheduling. This is especially true for the more immersive systems shown in Figure 2.1 such as interactive whiteboards and tele-presence systems; as they are inherently costly and hence of limited availably to employees. Additionally, these systems often require significant preparation / setup time. Therefore remote collaboration can currently be seen as an "event", discouraging their usage and hindering the effectiveness of the team.

Another key aspect of collaboration is the sharing of documentation and subsequent discussions. Remote collaboration has struggled to effectively achieve this, with many of the current systems making it difficult to convey ideas without extensive descriptions and backtracking. It is hard for these systems to match local tools such as paper, pens and whiteboards, which still take precedence since they provide a physical, immersive, and flexible medium for easy sharing [8]. An indication of this is the use of paper within the workplace, which has consistently increased from year to year [9].

3. CASE STUDY: SAP APPHAUS, CITYWEST DUBLIN

Figure 3.1: SAP Apphaus, Dublin

Observations and interviews were carried out in SAP's Dublin AppHaus office, shown in Figure 3.1, in order to gain an insight into how employees of a large multinational company collaborate with their global colleagues. Learnings obtained from this process provide an insight to the limitations that exist with current corporate global collaboration tools. As a result of these observations a list of user needs was compiled over the course of the research which highlights the shortcomings in current corporate global collaboration practices and identifies the key features that should be addressed when designing global collaboration tools.

The AppHaus in SAP Dublin was opened in July 2012 [10] and houses teams of developers in an open plan, flexible space which serves to facilitate local collaboration between developers. In terms of global collaboration, many different systems and procedures are currently in place in SAP in an attempt to encourage remote collaboration on projects. The current methodology consists of an arrangement which divides each location into teams of 2-10 people. These teams are known as "Scrum Teams", and each team works for a period of time known as a "Sprint". The length of these sprints typically depends on the project, but a two week sprint is the most common period of time. Two different meetings commonly take place within this structure; a daily "Scrum Meeting" which summarises the internal progress on the project, and a "Sprint Review" which occurs at the end of each sprint and is a collaborative meeting between all locations involved in the project. Typically, a final sprint review will take place at the completion of each project.

With regards to hardware and devices currently used by SAP for remote collaboration, an impressive Cisco tele-presence system is located in each of their global locations. The system consists of a "round table" configuration, which uses three widescreen monitors and three HD cameras to simulate a meeting whereby all of the people are co-located around the one table. As well as this, SAP has currently a number of teleconference units on their premises. These consist of a widescreen monitor and HD camera that are mounted on wheels. Therefore the units can be moved around the building with ease. However over the course of nine months the researchers observed that this video conferencing tool was rarely used for its intended purpose. It was instead used as a monitor for a computer. Common commercial video calling tools such as Skype are not permitted to be used on the SAP network due to security concerns.

With respect to software, a project management system called 'Jira' is used by SAP to electronically monitor the progress of projects. Another piece of

software used by the company is a push server called 'SAP Connect', which is used for the sharing of documents and can also be used for instant messaging and video chat.

As can be seen, many different approaches have been undertaken by SAP in an attempt to alleviate or reduce the problems currently encountered with remote collaboration. However when interviewing employees at different levels of the company it was discovered that these tools do not adequately cater for their needs in terms of remote collaboration. Many of the issues discussed in Section 2 were found to be common points of frustration for employees when remotely collaborating with colleagues. Scheduling and the formality of videoconferencing were seen as a major frustration. Oftentimes the structured nature of these meetings serves to inhibit collaboration, with many employees telling of how they postpone making contact and sharing ideas with remote colleagues due to the presence of an upcoming tele-presence meeting on their schedule. The long and sometimes complicated set up times of video conferencing equipment mean that they are underutilized, or not used for their nominal purpose. These tools are not as accessible as instantaneous video calling tools like Skype or Facetime and do not cater for spontaneous, informal unscheduled global collaboration. The needs discovered throughout the interview and observation period at the SAP AppHaus are summarised in Table 3.1 below.

Table 3.1: Discovered Needs of SAP employees for remote collaboration

To remove the *event* nature of remote collaboration
A means to communicate visually
A system that is easy and intuitive to use
A tool that encourages more frequent remote collaboration
A strong and clean connection between remote locations

When interviewed, many employees expressed the wish to be able to recreate the serendipitous interactions (e.g. a 'watercooler moment') that they have day to day with other employees in the AppHaus on a global scale. They spoke about the way in which these casual interactions spark ideas and ignite the creative process. Therefore the need to cater for global serendipitous interactions was highlighted as a major shortfall of the global collaboration experience within SAP. These learnings are corroborated by the fact that more and more software companies are preventing their employees from working at home. Yahoo for example believes that the productivity of one person working solo cannot compete with the richness of ideas and insights which come from hallway and cafeteria discussions [11]. A means to replicate these interactions globally is currently unvailable.

4. ME310 SURVEY RESULTS & FINDINGS

A survey was conducted on students partaking in the ME310 course based in Stanford University, California. In this course, a team of four students in Stanford University is partnered with a global team of four students based in a university outside of the United States for a 9 month (50% time commitment) collaborative design project with a corporate client. As such, students experience first-hand the shortcomings and difficulties of current collaborative tools.

Therefore, the students tended to try a variety of different tools in order to attempt to limit the problems that are present when separated by time zones and space.

The survey was presented to the students with the aim of answering questions regarding two primary areas of remote collaboration: the tools the students considered to be the most beneficial during the project, and the main difficulties the students found to be present when attempting to collaborate on a project remotely. For the first part of the survey, the respondents were presented with a list of collaborative tools, and were asked to choose the three most important tools they used from 1 to 3, both for local and global collaboration. The second part of the survey involved requesting students to give five headings a score from 0 (unimportant) to 3 (critical). The five headings are Geography, Culture, Time Zone, Academic Structure/Background and Language.

The survey is based on 19 respondents – 6 from global universities and 13 from Stanford University. One important thing to note is that the age range of the respondents was typically 23-26. Table 4.1 and Graph 4.1 display a summary of the key findings from the survey.

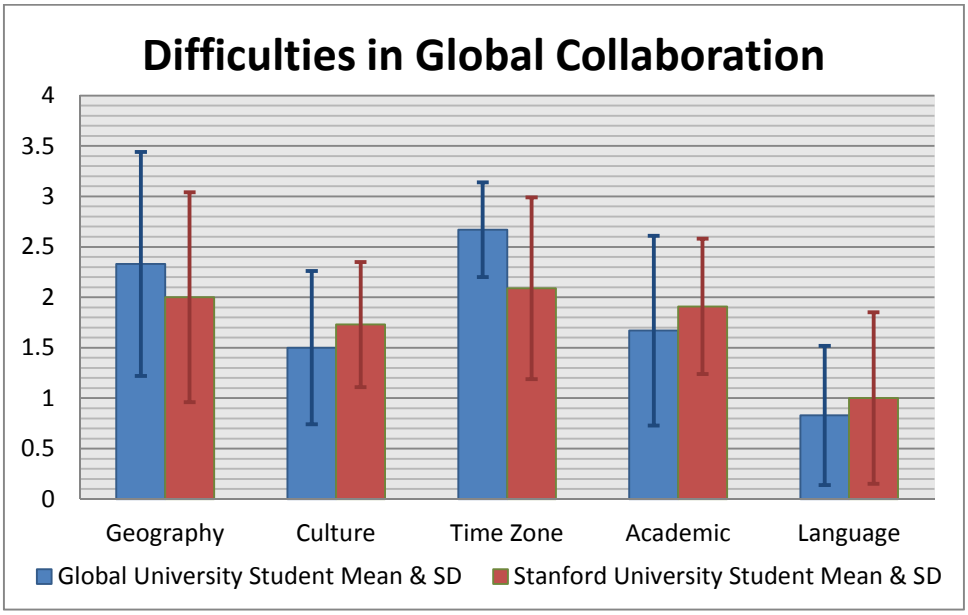
Table 4.1: Most important tools for local and global collaboration

Collaborative Tool	Global University Student		Stanford University Student	
	Local	Global	Local	Global
Whatsapp	4	-	-	1
Google Drive	4	4	8	5
Email	3	5	8	9
Phone	2	-	7	1
Google Hangout	3	6	-	8
Dropbox	2	3	6	6
Polycom	-	-	-	3
Pivotal Tracker	-	-	1	-
QQ International	-	-	-	2
Text Message	-	-	4	-
Facebook	-	-	-	2
Facetime	-	-	1	1

Table 4.1 displays the number of mentions of each of the collaborative tools displayed in Column 1 in the global university students' and Stanford University students' top three collaborative tools for local and global collaboration. One interesting finding is that students tended to try numerous different tools in rapid succession, keeping tools that worked and dropping tools they felt had no additional benefit to their collaborative needs. This may be due to the fact that the students were unconstrained by company standards, where rigid practices are in place for communication and collaboration. More modern tools tended to dominate, such as the smart phone instant messaging application Whatsapp, the video communication platform Google Hangout, and file sharing platforms such as Google Drive and Dropbox. It is also of note that more traditional forms of communication, such as email, are still widely used for both local and remote collaboration, as represented by the highest cumulative mentions for email.

Students in Stanford University tended to find a more diverse selection of collaborative tools important. This may be primarily due to availability of resources (such as Polycom, a telepresence device) and due to culture (such as QQ

International, an instant messaging service popular in China, where one of the global universities was located). One interesting finding from the survey is that tools trialled for global collaboration are becoming so effective they are then used for local collaboration in the latter portion of the project, such as Dropbox. There is also a trend for newer technologies to overshadow older technologies, such as Whatsapp replacing text messaging. This may be due to younger students using these tools when compared to older corporate employees.



Graph 4.2: Mean and standard deviation (SD) scores for difficulties in remote collaboration

Graph 4.3 displays the mean and standard deviation (SD) of the scores applied to each of the 5 headings of difficulties, allocated by global university students and Stanford University students. For the global university students, it can clearly be seen that differences in time zones were deemed the biggest difficulty in remote collaboration, with a mean score of 2.67 out of 3, and a low variability in response, as represented by the low standard deviation of 0.47. This was followed closely by geographical distance, with a mean score of 2.33, but with a greater variability in response, as shown by the standard deviation of 1.11. Language was deemed the least important difficulty with a mean score of 0.83. It must be noted that this may be due to the ME310 course being conducted through the English language, and as such the majority of participants are competent with English.

With regard to the respondents from Stanford University students, it can be seen that the results of the survey are identical to the global university students with respect to the order of importance, although with different weighting of scores. Time zone differences are again responsible for the most difficult aspect of remote collaboration, with a mean score of 2.09, followed closely by geographical distance, with a mean score of 2.00. Language is again deemed the least difficult facet of remote collaboration. For both categories of students, culture and academia are the intermediate difficulties for remote collaboration.

5. CONCLUSIONS

Detailed need-finding with SAP identified key requirements for any future collaborative tool to have success. Deficiencies (in remote compared to local communication) identified in the literature were not explicitly identified in SAP, but are consistent – e.g. the 'need to communicate visually' echoes previous findings with regard to body-language and immersive, flexible tools such as whiteboards.

Significant constraints with regard to choice of communication/collaboration tools were identified in practice in the corporate environment. In the student cohort, as expected, there were much fewer constraints with a wide range of tools used – typically each team trying of the order of 20 hardware and software tools before settling for regular usage of approximately 8. Of the tools identified as most important, email and GoogleDrive were the most popular – both of which were the only asynchronous tools noted. Of the synchronous tools, Google Hangout was comfortably the most popular for global communication, with phone and SMS used for local communication.

The student cohorts identified time difference and geography (i.e. remoteness) as very important to critical – possibly explaining the dominance of asynchronous communication tools amongst those listed. It is worth noting that the above asynchronous tools were favoured equally, both for local and remote collaboration. However there was a noticeable split between use of global and local synchronous tools, implying that the former requires further development to match the convenience of local tools.

More generally, despite the recent proliferation of software tools and the willingness of the student cohort to experiment and move rapidly between tools, the efficiency issues noted in the literature (with regard to the difference in effectiveness of local vs. global teams) persists.

6. ACKNOWLEDGEMENTS

The authors would like to acknowledge the help and support of SAP (in particular Tony O'Donnell, Mark Hill and Adam Their), Margaret O'Mahony, Gareth Bennett, Donal Holland, Larry Leifer and George Toye as well as all the students of ME310.

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