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Recommended Citation

Bastida, Robert; Gupta, Hritik; and Wingreen, Stephen C., "A Comparative Study of the Effect of Blogs and Email on Virtual Team Performance" (2013). *PACIS 2013 Proceedings*. 80.

<http://aisel.aisnet.org/pacis2013/80>

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A COMPARATIVE STUDY OF THE EFFECT OF BLOGS AND EMAIL ON VIRTUAL TEAM PERFORMANCE

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Abstract

Virtual Teams (VTs) offer great advantages but have different challenges compared with co-located teams. This study explores using blogs and email to see if improvements can be made to virtual team effectiveness. This preliminary study is qualitative in nature and uses a quasi-experiment to compare 2 teams performing the same project; one uses email while the other uses a blog tool. Once the project was complete the participants filled out a Q-sort and a short survey. Additional analysis of the artefacts generated by the experiments also form part of the result set. The key benefits of using the blog were hoped to be; increase team trust, increase team performance and output, increase team satisfaction and realise a communication tool that could be used in a virtual team environment. The main findings were; the qualities of the output deliverable from both teams were nearly the same; those using the blog reported 'having a sense of fun' and 'individual satisfaction', while the email team reported 'the current status of the project was easily viewed'.

Keywords: Virtual teams, blogs, e-mail.

1 INTRODUCTION

A virtual team (VT) is defined as “small temporary groups of geographically, organizationally and/ or time dispersed knowledge workers who coordinate their work predominantly with electronic information and communication technologies in order to accomplish one or more organization tasks” (Ale Ebrahim et al. 2009, pg. 1578). Virtual teams (VTs) are becoming popular as they allow companies to bring in the best talent without regard to geographic constraints (Vlaar et al. 2008; Shachaf 2008). This talent is often only required for the length of a project which often suits both the employer and the employee (Lendeers et al. 2003; Paul et al. 2005). VTs also allow experts to be employed at lower cost (Munkwold & Zigurs 2007).

Key enablers of VTs are the internet and communication tools that have been built to enhance it (Gassmann & Von Zedtwitz 2003b; Hertel et al. 2005; Powell et al. 2004; Sivunen & Valo 2006). These tools allow the team members to exchange information and carry out their tasks effectively. Various information and communication technologies (ICTs) such as web, email and video conferencing (Hertel et al. 2005; Shachaf 2008; Sivunen & Valo 2006) have been implemented for VT communication. Prior research also demonstrates the effectiveness of blogs (weblogs) and wikis as collaborative tools for virtual team communication (Brown et al. 2007). Effective communication among members in a distributed team is essential for various projects such as engineering projects (Zhang et al. 2008).

This research focuses on the appropriateness of blogs as the key VT communication tool and the impact of blogs on VT performance. Piccilo et al. (2004) state that communication is a key aspect of co-ordinated teams giving evidence that communication is vital for a virtual team. The current literature on virtual teams (Brown et al. 2007; Knox & Wilmott 2008; Sivunen & Valo 2006; Thissen et al. 2007; Turban et al. 2011) suggests email, videoconferencing, wikis, blogs, instant messaging and phone as the various tools that can be used for virtual team communication. There are gaps in the literature as blogs have been mentioned in previous research on VTs, but mostly in a supportive role (Brown et al. 2007; Darisupadi & Sharma 2008) and the researchers observed that they are not generally used as the core communication and collaboration tool. Further, the literature does not demonstrate how blogs can be used for these purposes. As an example, Turban et al. (2011) state that collaborative tools such as blogs can be used when there is a need to solicit inputs from customers in certain situations for instance, next generation notebooks. However, there is no perspective on the utilities of blogs as an information sorting and ordering tool in a VT project. The literature has gaps as, to the best of our knowledge, there is no study focusing on the impact of blogs on virtual team performance when they are used as the core communication tool.

Using a quasi-experiment based on two virtual teams, one using blog and the other using email for performing the same task, this research investigates blog usage as a medium for effective communication and management in a virtual team (VT) project. This is distinct from GSS (Group Support Systems) which are defined by De Vreede (1997, pg. 146) as “information technology designed to enhance the productivity of group meetings and group decision making.”

The main research question for this study is: Can blogs improve the performance of virtual teams?

In the next section, we present the relevant literature, which is followed by a theoretical framework. Further, we present our methodological approach for data collection. In the subsequent sections, we present the findings of this research and carry out an analysis of the findings. The paper concludes with the relevance of this research for practitioners and academics and we put forward some recommendations for further research in the area of virtual teams.

2 LITERATURE REVIEW

This section presents the relevant literature in the context of virtual teams.

2.1 The Rise of the Virtual Team

The concept of virtual team has seen significant development over the last decade. This trend has been followed for many reasons such as; increased globalisation, better communication bandwidth and reliability, better communication applications (software), proliferation of internet enabled devices, and a greater range of employer/employee arrangements now available (Kirkman et al. 2002; Walvoord et al. 2008). In the industry, virtual teams have sharply risen in numbers due to the benefits they offer to the implementing organisation. This can be seen as a consequence of the rising number of multinational corporations; from 3,000 in 1990 to 63,000 in 2003 (Gabel & Bruner 2003).

Today, larger companies have implemented virtual teams, which is driven by developments in the internet (Hertel et al. 2005) and ICTs (Powell et al. 2004). The main advantages of VTs are that they can be a cost effective way of tapping into expertise and addressing scarce resources across geographic and other boundaries (Munkvold & Zigurs 2007). This in turn allows companies to staff their workforce almost at will, to match their business' rapidly changing circumstances (Leenders et al. 2003; Paul et al. 2005). VTs can also lead to a competitive advantage (Bergiel et al. 2008) as they are able to produce more work in a short space of time. The employees, or often contractors, who do the work, also benefit from increased flexibility, higher pay and interesting varied work (Munkvold & Zigurs 2007).

The interest in how virtual teams work, how they can be improved, and managed is huge. A simple search on Amazon.com in the book section for 'virtual teams' returned 6680 results (up from 5951 in May 2012) in the beginning of February 2013 (Amazon website 2013). This is indicative of the importance of VTs in today's information workplace. Any improvements in the outcomes or effectiveness of virtual teams might have a very significant impact if they were realised across all VTs today.

2.2 Virtual Team Communication Problems

Although electronic communication has been the enabler of VTs, it is not surprising that VTs are marked by communication problems (Anderson et al. 2007; Diam et al. 2012). Darisipudi and Sharma (2008) state: 'Due to deficiencies in e-mail, chat and phone such as chain e-mails, chat scripts and inability to save phone conversations, clutter is created and information disintegrates. Information also disintegrates on file servers where various versions of the project plan or specification may be held. Additionally, virtual teams are highly vulnerable to communication failures and mistrust among team members (Malhotra et al. 2007; Rosen et al. 2007).

Email is an essential tool for every information worker and so it is widely used in VT communication due to its attractive mechanisms for sending messages and files (Sivunen & Valo 2006; Thissen et al. 2007). It can however not be neglected that email leads to information disintegration. Some brief examples; email chains, incorrect subject lines, multiple topics in a single email, everyone needs their own filing system, too much email and spam. Suffice to say, the problem manifests itself in information overload, information clutter, lost information, lost time searching for information and increased confusion (Jones et al. 2004; Schuff et al. 2006). In a VT context, this can manifest itself as mistakes being made and more re-work, thus reducing productivity and satisfaction. Blogs have certain striking features like instant posting, the posts are automatically sorted (latest first) and depict a strong sense of author's views on the topic (Nardi et al. 2004). The research (Nardi et al. 2004) also discovered that blogging is relatively easier than sending out emails, enables information broadcasting and speculation features which can be seen as additional communication between the users.

Additionally, blogs offer a collaborative environment with a potential to form groups and communities to facilitate formal and informal conversations (Gupta et al. 2012). Such group communications aim at co-operative team working and tend to enhance the cognitive capabilities and also facilitate team learning (Bui & Jarke 1986).

2.3 Virtual Team Management Problems

Virtual teams differ significantly from co-located teams, and hence require different management techniques when compared with co-located teams. Management issues are vital to the success of virtual teams and some studies look at the early stages of the VT formation (Ayoko et al. 2012; Shachaf 2008) where more effort needs to be focused in order to build the necessary trust. Other literature focuses on the manager's ability to articulate the milestones and goals clearly (Curseu et al. 2008; Hsu et al. 2012; Kanawattanachai & Yoo 2007). A few others explore whether the manager provides adequate and appropriate feedback (Ayoko et al. 2012; Bergiel et al. 2008; Piccoli & Ives 2003) to the members. Many common team management activities are the same for VTs but they need to be done with extra vigilance, since there is no visual feedback to give early warning of trouble (Daim et al. 2012).

There are concerns around infrequent interaction and absence of a visual feedback. Co-located teams benefit from the fact that they can meet each other and build relationships amongst themselves. This is also a factor in the management of virtual teams, when it is possible to implement, and aids the cohesion and coordination aspects of team dynamics (Gaudes et al. 2007). However, virtual teams do not always have the opportunity to do so, and therefore management needs to be more vigilant in other aspects. For example, management may address the nature of the communication technology, and the business processes utilised by the team. Even small improvements in this area may have significant effects in both productivity and team member satisfaction over a number of projects.

Trust may be present (or absent) between the VT members and the management. For the team management two different paradigms emerge; the moviemaker and the surgeon (Lema, 2012). The former considers a task as a movie where every scene and every minute detail is extracted and micro-managed. While the latter refers to a management style where the management steps back and allows the team members to get on with the task like surgeons (independent experts).

Synchronous meetings are another essential element of virtual team building, and when VTs are global in their extent, also present challenges. Malhotra et al. (2007) and Lema (2012) suggest making the 'pain shared' by changing the times meetings are held so it is inconvenient for everyone at some point. This contributes to a sense of togetherness among the team members. Inter-member relations can be further strengthened through a social relationship building effort. Malhotra et al. (2007) also found that pairing members to work on tasks helps build ties within the team and made them more cohesive overall.

Peer pressure is yet another management tool. In their study, Piccoli et al. (2004) note that the most effective teams had one or two highly conscientious members who spent a significant amount of time prodding teammates. This is further echoed by Lema (2012) who found that a daily status report gives everyone a chance to explain today's achievements and discuss tomorrow's plans, and increases team members' commitment to the task. Peer pressure is an example of "subjective norms" that influence team members to perform or not to perform desirable behaviours (Ajzen, 1991, pg. 188). Ajzen (1991) states that 'attitudes towards the behaviour, subjective norms with respect to the behaviour and perceived control over the behaviour are usually found to predict behavioural intentions with a high degree of accuracy'. In the context of virtual teams the behaviour refers to the task in hand while attitude and perceived control refers to the two aspects of the behaviour. Perceived control refers to the ability to complete the task. "Subjective norms" create an incentive to complete the task.

3 THEORETICAL FRAMEWORK

The literature (Choi et al. 2010; Kanawattanachai & Yoo 2007; Wegner 1986) indicates that effective teams have well developed Transactive Memory Systems (TMS) (Hsu et al. 2012). In simple words, effective teams develop an internal ‘memory’ that allows them to co-ordinate tasks with ease and efficiency. Such teams are aware of the strengths and weaknesses of their team members and respond quickly to situations and problems and hence are able to complete tremendous amounts of work with relative ease. The teams have trust in their mates’ credibility and are instilled with the three elements of TMS: specialization, co-ordination, and credibility.

Specialization

The first element of TMS refers to the selection of the right team members for the project (task). It creates a better mapping between skills and task and raises the team performance. Each member needs to know what others are expert in (Lema 2012). This is absolutely critical as selection of poorly matched members can lead to terrible results and often encourage a feeling of dissatisfaction. Satisfaction is critical for team performance (Curseu et al. 2008; Shachaf 2008) as pointed by Lin et al. (2008). Blogs can be an effective tool for VTs if the team members are well acquainted with using blogs. This could further improve team satisfaction.

Co-ordination

The second essential element of a TMS is co-ordination among the team members (experts). Shachaf (2008) point out that team cohesion (Sivunan & Valo 2006) is essential for teams that are culturally diverse and is generally found to be low in virtual teams. Furthermore, each team member can seek help from others when working in an unfamiliar area of the task. Hence, a set of isolated individuals finally turn into a team of vastly knowledgeable and experienced members who are responsive to a variety of tasks and situations. Consequently, team satisfaction (Lin et al. 2008) is also boosted as everyone easily becomes used to new areas of the task by quickly grasping knowledge from their peers. As a tool, blogs have the capability to foster collaboration and the users can form communities on the web (Goodwin-Jones 2003). Blogs are also a well-known communication tool¹ (Singh et al. 2008) and are hoped to provide a co-operative group decision making environment (Bui & Jarke 1986).

Credibility

The previous two aspects of a TMS (specialization and co-ordination) finally lead to credibility and also raise team performance. Team members are now in a position to judge what to expect from their counterparts, they get to know each other’s idiosyncrasies and develop mutual understanding. This is partially due to extensive peer pressure (Piccilo et al. 2004) and leads to commitment towards the task (Lema 2012) and understanding which is essential for a VT success as a precursor to trust. This kind of synergy is highly desirable in a VT and takes time to develop. Trust building is also ensured with credibility which is very important (Ayoko et al. 2012; Shachaf 2008) for the team. Blogs can prove to be a useful tool for enhancing team trust which leads to stronger team ties (Chai and Kim 2010).

However, trust in a team is slow to build up but easy to tear down. Many things can undermine trust and one of the most common in VTs is miscommunication (Shachaf 2008). Another essential aspect of trust is between the virtual team members and the management. Lema (2012) suggests that surgeon style of management as more appropriate to virtual teams because it fosters trust building as team members are all expert in a particular area of the project (task).

¹ The key blog features that the researchers felt would help project communications were:

1. Central location for all communications.
2. Categories for easy browsing and better conveyance of message context.
3. Single structured way of creating and storing communications, i.e. posts and comments, with categories, date and author stamped.
4. Elements of social media e.g. the ‘Like’ and ‘Comments’ features.

4 RESEARCH METHODOLOGY

This research implemented a quasi-experimental method (Bryman and Bell 2011) to determine the effectiveness of blogs on virtual team performance. A quasi-experiment was selected as the most appropriate method given the need to compare blogs to other methods of team coordination, the exploratory goals of the study, and the small number of participants available. There were two virtual teams, one using email to coordinate their work, and the other using a blog to coordinate their work. Both teams were assigned the task of constructing an online cookbook as the experimental task, and performance outcomes were measured by means of self-reported responses to Likert scales. The online cookbook page contents were expected to have a photo as well as ingredients and methods of cooking a particular dish. The cookbook was hosted on the website www.wordpress.com. The participants were instructed to create a cook book page each day for five days working approximately 15 minutes a day. The 15 minute time was for composing the menu entry, communication time was on top of this. It was hoped that the participants might feel that 15 minutes per page was a short time so they were permitted to just think of the recipe they wanted to do and then assemble/collate the photo, ingredients and method from items sourced on the web.

Two teams of four members each were recruited, all of whom had prior experience working in virtual teams. None of the participants had worked with each other previously. All participants possessed a sufficient prior technical familiarity with the use of email and blogs. In the context of this study, the email team is considered to be the “control” condition, on account of the widespread and common adoption, and nearly-universal familiarity that workers have with using email for work communications. Participants were instructed not to discuss the experiment with anyone outside their team during the duration of the experimental task. Table 1 reports the locations, nationalities, and occupations of the participants.

Team	Location	Nationality	Occupation
Blog Team	Brazil	Brazilian	Business Analyst
	Australia	Australian	Health Sector Trainer/Policy
	New Zealand	German	Technical Writer
	Canada	New Zealander	Software Developer
Email Team	New Zealand	New Zealander	Software Developer
	New Zealand	New Zealander	Software Developer
	New Zealand	New Zealander	Software Developer
	Australia	Indian	Software Developer

Table 1. Profiles of the team members

The experiment made use of the free WordPress blog tool which is located on the internet at www.wordpress.com. The advantages of using this tool was that it was free of cost, the latest version and many new features such as likes were automatically included. The very first step was to create member accounts on WordPress using a unique email address for each VT member. After entering the email address, all team members were informed that they would receive an acceptance email from wordpress.com which contained a confirmation link in it for clicking and confirming the member account. This ensured that the user was the same as the person whose account was actually created.

The blog offered tools which provided the opportunity to enter information in several categories that would be possible to communicate in email messages, but which appear in pre-defined categories on a blog. For instance, VT members made posts under ‘Status Update’, ‘About me’², ‘Questions’, ‘Info’ and ‘Instructions’ categories. In addition to this each post had a section to add comments to facilitate a discussion. By default, all these posts were time stamped which ensured a chronological ordering.

The blog was set up with a variety of menu pages: Cookbook, Soups, Entrees, Vegetables, Meats and Desserts. This permitted the members to slot their recipe pages under the correct parent page. The

² The content of the ‘About Me’ post was instructed as: ‘The post about you is designed to get everyone on the team socialising a little bit. A photo of you would really help’.

blog also came with instructions and hints about effective blog usage. Once the blog was set up, invitations were sent to the members of the blog team with instructions for logging in and setting up their accounts. Blog provided the capability that team members may be assigned various “roles”, such as Admin, Editor, Author or Viewer. Each member was assigned the ‘Editor’ role so that they could see comments straightaway and create pages. Considering the full-bodied information environment provided by a well-done blog setup, it was the judgment of the researchers that these characteristics of a blog satisfy the criteria for an operational definition of a TMS, since they allow the blog team to specialize, coordinate, and enforce credibility (through monitoring of other team members) their tasks.

The Q-methodology is appropriate for situations where the goals are exploratory, a rich and interpretive understanding of a phenomenon is desired, and there are limited or small numbers of participants (Brown, 1980). Therefore, following the guidelines proposed in prior research, we developed and administered a set of Q-sorts (Brown 1996) to collect data and capture the feelings and impressions of the participants of both the blog and e-mail team. The Q-statements were drawn from the literature and discourse on the topic (virtual teams), expert advice, and the informed judgments and observations of the researchers as the study progressed. Participants were asked to look at 27 different statements and sort them according to how they felt about their given method of communication, email or blog, for this project. Participants were instructed to sort statements "from the outside in", that is, first to choose the two statements they agreed with most strongly and then the two that they disagreed with most strongly, and enter them in the most extreme categories. Following this, they were then instructed to sort the next three most positive (agree) and negative (disagree) statements, followed by five statements each for "somewhat agree" and "somewhat disagree". Unranked statements were by default entered in the neutral response category. The data thus gathered was analysed using the PQ-method software that is commonly used in Q-methodology research (Brown 1996).

5 RESEARCH FINDINGS

This section presents the findings of this research that were reached through the survey, cookbook grading and analysis of Q-sort data.

5.1 Survey Results

Table 2 reports the responses to the following survey questions by rating them on a scale of 1 (easy) to 7 (difficult):

Question	Average for Blog Team	Average for Email Team
Q1. Did you find the WordPress tool easy to use?	3	1.5
Q2. Did you find the cookbook easy to make?	2	1.8
Q3. How easy did you find communicating with your team members?	2	2.3
Q4. Did you find collaboration with the other members satisfactory?	4	5
Q5. What was your overall satisfaction with the completed cookbook? (not satisfied 1 - 7 completely satisfied)	5.7	4.8
Q6. Did you feel your team was effective? (dysfunctional 1 - 7 very effective)	5.3	5.5
Q7. Did you feel you knew something about the other team members by the end of the project? (know nothing 1 - 7 know a lot about)	4.3	2.5
Q8. Overall was the project an enjoyable experience? (not enjoyable 1 - 7 very enjoyable)	6	4.3

Table 2. *The survey questions and results.*

It is evident from the survey responses (above) that the e-mail team found the WordPress tool³ easier to use than the blog team. The researchers believe this was due to the fact that all the team members were software developers and were comfortable working with email. Both the email and blog teams found that the project was easy as seen in their response to question 2. Further, both teams found communication with the other members quite easy (Q3.).

5.2 Project Outputs: Grading the cookbooks

Grading of the final cookbooks (output) was essential as it allowed the researchers to determine the overall team performance, communication levels (counts) and the resulting output of the project (task). The resulting cookbooks were graded using a cookbook guide adapted from Kolpas (2008). One person withdrew from the blog group before the experiment was completed, and the scores were scaled accordingly. The grading was done across 6 parameters: use of photos, economical with the words, listing all ingredients in order of use, keeping the method order logical, stating how many the dish serves and concise and accurate title. The outcomes showed that both teams completed the cookbook to a satisfactory standard and their final grades were: 6.63 for the blog team and 6.7 for the e-mail team. This gave the researchers a preliminary indication that both email and blog tools allowed the team members to organize their team information and communications well. This suggests that email and blog tools are better than traditional group support systems where information processing amongst the group members suffered significantly (Dennis 1996). These results are however, inconclusive given the small numbers participating in the study. As suggested by previous research (Lam 1997) the effectiveness of a GDSS (Group Decision Support System) cannot be solely measured on the basis of the project outcomes hence, on similar lines, the researchers decided to review the project teams' communications for adjudging the effectiveness of blogs and email. A measurement of the quantity and types of communication used by the teams (Table 3) reveals that the blog team engaged in significantly more communications than the email team:

Category	Blog team	Email team
About me	4	4
Info	2	9
Instructions	7	0
Questions	15	1
Status updates	7	6
Totals	35	20

Table 3. Communication counts among the team members.

The difference between the teams, using a t-test for population proportions, is significant at $p < 0.0001$, therefore confirming even with a small sample, that the blog team engaged in significantly more communication than the email team.

5.3 Q-Sort Results

The Q-sort data was analysed using a centroid factor analysis, as suggested by prior research (Wingreen et al. 2009). Two- and three-factor solutions were examined at first, however, since the three-factor solution converged to a two-factor solution, there was no need to continue, and a two-factor solution was adopted. Table 4 presents the results of the 2-factor solution, with "defining sorts", as reported by the PQ-Method software, in boldface. The 2-factor solution demonstrates that all members of the blog team represent factor 2, and all members of the email team represent factor 1.

Team	Person	Factor 1	Factor 2
Blog	Ucname22	0.5291	0.6255

³ The dual role of the blog tool as a communication medium and the output medium does not affect the results as the two areas are quite distinct from each other. The communication side of things was using the 'post' feature; this is the traditional blog 'diary-type' entry. The output cookbook was using the 'page' feature and each page slotted into the predetermined menu/chapter. The participants had no confusion over this as they asked for no clarification and made no mistakes.

Blog	Ucname23	0.2483	0.6176
Blog	Ucname24	0.4258	0.5132
Email	Ucname44	0.7699	-0.3618
Email	Ucname45	0.5801	-0.4232
Email	Ucname46	0.7336	-0.0779
Email	Ucname47	0.8308	-0.1464

Table 4. Q-Factor Matrix, 2-factor solution

No.	Statement		Type 1		Type 2	
			z-score	rank	z-score	Rank
1	I was part of a team	1	0.95	5	0.61	8
2	I experienced individual satisfaction	2	0.29	14	1.28	3
3	I was part of an effective team	3	1.04	4	0.32	11
4	I experienced a sense of fun	4	0.38	12	2.51	1
5	Communication worked well	5	0.87	7	0.94	4
6	The methods of communication were easy to use	6	0.53	11	-0.21	16
7	Records of communications were well organised	7	-0.82	20	-0.73	19
8	Decisions made were recorded	8	0.53	11	0.29	13
9	Information regarding task co-ordination was easy to find	9	-0.06	15	-0.43	17
10	Problems were quickly resolved	10	1.41	2	0.43	10
11	It suffered from information overload	11	-1.8	27	-1.15	25
12	It suffered from disorganisation of information	12	-1.42	26	0.74	7
13	Pieces of information were lost	13	-1.08	21	-0.95	21
14	Everyone was pulling their weight	14	0.93	6	-1.15	25
15	I was letting the team down	15	-1.39	25	-0.97	22
16	I was leading the team	16	-1.19	24	-1.66	27
17	I knew the others' strengths well, considering the short time of the project	17	-0.81	19	-0.93	20
18	As a team member, this communication format was great	18	0.64	9	0.54	9
19	If I was the project manager, this communication format would be great	19	-0.17	17	0.85	5
20	If the project was re-visited in 18 months' time, it would be easy to pick up where it left off	20	0.76	8	-0.53	18
21	The resulting cookbook/project was of a high standard	21	0.3	13	1.45	2
22	There should have been more synchronous communication	22	-0.46	18	-1.13	23
23	The others got to know me well, considering the short time of the project	23	-1.16	23	0.09	14
24	I got to know the others well, considering the short time of the project	24	-1.14	22	0.31	12
25	I trusted others	25	-0.06	16	0.83	6
26	The current status of the project was easily viewed	26	1.82	1	-1.24	26
27	My voice and views were easily heard	27	1.12	3	0.10	15

Table 5. Q-sort statements with their corresponding ranks and z-scores

No.	Statement	Factor 1 (z-score)	Factor 2 (z-score)	Difference
Email Team				
26	The current status of the project was easily viewed	1.816	-1.237	3.053
14	Everyone was pulling their weight	0.931	-1.153	2.084
20	If the project was re-visited in 18 months' time, it would be easy to pick up where it left off	0.759	-0.530	1.289

27	My voice and views were easily heard	1.124	-0.102	1.225
10	Problems were quickly resolved	1.405	0.428	0.977
	Blog Team			
25	I trusted the others	-0.055	0.828	-0.883
2	I experienced individual satisfaction	0.289	1.283	-0.995
19	If I was the project manager, this communication format would be great	-0.167	0.846	-1.013
21	The resulting cookbook/project was of a high standard	0.304	1.451	-1.147
23	The others got to know me well, considering the short time of the project	-1.157	0.093	-1.249
24	I got to know the others well, considering the short time of the project	-1.141	0.307	-1.448
4	I experienced a sense of fun	0.383	2.511	-2.128
12	It suffered from disorganisation of information	-1.423	0.735	-2.158

Table 6. Descending array of differences between factors 1 and 2

Table 5 reports the statement rankings and z-scores for top-ranked statements in factor 1 and factor 2, and Table 6 reports the descending array of differences for the top 5 and bottom 8 statements between factors 1 and 2. The factors are interpreted as "types" of persons according to their perspective on the topic of the Q-sorts domain, in this case, how they felt about the communications during their work on their virtual team. Type 1 (factor 1) is characterized by a sense of efficiency and expedience, as exemplified by the top three statements ranked by the email team: "the current status of the project was easily viewed", "problems were quickly resolved" and "my voice and views were easily heard". Type 2 (factor 2) is characterized by a sense of personal satisfaction, "fun" and quality of the work, as exemplified by the statements ranked highest by the blog team: "I experienced a sense of fun", "the resulting cookbook/project was of a high standard" and "I experienced individual satisfaction". The descending array of differences (Table 6) reports the greatest differences between the email and blog teams were: 1) "the current status of the project was easily viewed", 2) "everyone was pulling their weight", 3) "if the project was re-visited in 18 months' time, it would be easy to pick up where it left off", 4) "my voice and views were easily heard", and 5) "problems were quickly resolved", with the email team prioritizing all of these statements higher than the blog team. Similarly, table 6 also reports the greatest differences that were present in statements that the blog team prioritized higher than the email team. The statements were: 1) "I experienced a sense of fun", 2) "I got to know others well, considering the short time of the project", 3) "Others got to know me well, considering the short time of the project", 4) "The resulting cookbook/project was of a high standard", 5) "If I was the project manager, this communication format would be great", 6) "I experienced individual satisfaction" and 7) "I trusted others". Surprisingly, the statement that had the greatest difference was "It suffered from disorganisation of information". Although both teams produced cookbooks that were evaluated as roughly equivalent in quality, the Q-sort analysis reveals that there were significant differences between the teams in their approach to their work. Or, to put it another way, in this exploratory study the blog team performed at the same level as the email team, but with a distinctly different team culture and work ethic. The blog team 'felt' better about their team trust, their output and their personal satisfaction.

6 ANALYSIS AND DISCUSSION

The research findings suggest that blog usage in virtual teams generates a sense of satisfaction, effective communication, trust and mutual understanding among the virtual team members. Blog usage reduces miscommunication as well. Our research question therefore asked: 'Can blogs improve the performance of virtual teams?'. The researchers believe that blog and email usage in virtual teams improves different aspects of transactive memory systems (TMS):

Specialization: Specialization (Choi et al. 2010; Hsu et al. 2012; Kanawattanachai & Yoo 2007; Wegner 1986) is boosted by good skill matching and leads to higher satisfaction levels. Satisfaction is critical for a virtual team performance (Curseu et al. 2010; Lin et al. 2008; Shachaf 2008). However, in this case, the email team had a greater skill matching than the blog team as all team members were

software developers and were accustomed to using email, yet the email team was less satisfied. By analysing the Q-sort results it clearly came up that the blog team experienced a great sense of individual satisfaction during the whole project. The level of satisfaction in the email team was quite low. The same can be inferred from the survey responses (Q5) where the blog team declared having more of a sense of satisfaction. Contrary to what the researchers expected, the email team was more 'specialized' but still the team members did not achieve a good level of satisfaction.

A sense of satisfaction lead to a feeling of 'fun' in the blog team which is another interesting finding of this research. This can be drawn from the Q-sort results and survey responses to a question focusing on experience with the project (Q8). The researchers believe that in a real world project, blog usage would lead to a greater commitment towards the task and would significantly improve motivation levels of the team members. This will automatically ensure that the team will perform better. Also, after the success of a project the team members will have a greater appetite for the next project. Hence, blog usage in virtual teams can greatly improve team satisfaction which could not be achieved by using email.

Co-ordination: Team co-ordination is another important element that contributes towards building great virtual teams (Choi et al. 2010; Hsu et al. 2012; Kanawattanachai & Yoo 2007; Shachaf 2008; Sivunan and Valo 2006; Wegner 1986). Co-ordination is improved by effective communication (Zhang et al. 2008) and team cohesion. The Q-sort findings show that the blog team enjoyed slightly better communication levels among the team members than the email team. The opposite is inferred by the survey findings (Q3), which indicate that the email team enjoyed better communication. The members of the blog team however communicated far more among themselves than the email team as seen by a close inspection of the cookbooks during the cookbook grading phase. The researchers conclude that blogs tend to improve the communication levels in VT projects.

Virtual team co-ordination is also boosted by team cohesion as indicated in the literature (Shachaf 2008; Sivunan and Valo 2006). The Q-sort findings indicate that both the blog and the email team felt that they were part of an effective team. The blog team more strongly felt that they did not need more synchronous (eg. videophone, phone etc.) communication whereas the email team somewhat less strongly felt that there was no need for more synchronous communication. The email team felt that the team members were contributing to the task equally which is exactly opposite to what was observed in the case of blog team. The email team felt that their problems were more quickly resolved than seen in the blog team. Further, the email team felt that their voice and views were more easily heard than the blog team and that 'the current status of the project' was easily traceable which is exactly opposite to the blog team's perceptions. The researchers conclude that email team had a greater degree of team cohesion than the blog team. This is inferred by the survey findings as well (Q4), which state that the email team had a greater level of collaboration among the team members. The finding is however contrary to what was expected by the researchers and can be attributed to the simplicity of the project.

The researchers believe that both email and blogs impact different aspects of virtual team co-ordination. Blogs encourage effective communication which leads to a better flow of thoughts and ideas in the virtual team. Similarly, email encourages a greater team cohesion which can benefit the implementing organization in several ways: the team members would know each other well and be in a position to form strong professional relationships. Further, email use can boost team spirit which can be carried on to the next project. From a management perspective, a higher co-ordination among the virtual team members leads to a greater efficiency and the task can well be accomplished within the allocated timeframe and budget and hence, both blogs and email contribute to team co-ordination in different ways.

Credibility: Credibility is boosted by specialization and co-ordination and is the final ingredient to building up a successful virtual team (Choi et al. 2010; Hsu et al. 2012; Kanawattanachai & Yoo 2007; Wegner 1986). Credibility leads to trust, mutual understanding and reduction of miscommunication.

The Q-sort findings show that the blog team had developed a strong feeling of trust (Ayoko et al. 2012; Lema 2012; Shachaf 2008) amongst themselves and the same was not much pronounced in the email team. Trust is severely damaged by miscommunication (Shachaf 2008) and the blog team had lesser levels of miscommunication than the email team. The blog team enjoyed greater mutual understanding (Lema 2012; Piccoli et al. 2004) among their team members than the email team as they strongly felt that their team members knew them well and weakly felt that they knew their team members well which is contrary to the perceptions of the email team who felt that both them and their team members did not know each other well. This finding is also confirmed by the survey results (Q7), which indicate that blog team had more mutual understanding than the email team. The researchers conclude that the blog team was more credible than the email team as the team members trusted each other and had a great mutual understanding among them. Credibility ensures that the virtual team is well built and can suit a variety of tasks that are assigned to the team as the team members know each other well.

The researchers feel that the blog team had a different and by most measures, a better developed transactive memory system than the email team. This was reached through greater satisfaction and enhanced communication and credibility. The cookbook grading reveals that the cookbook created by the blog team was nearly the same as the email team. The researchers believe that although, the outputs of the project were the same, the blog team enjoyed a different team culture and work ethic than the email team. The work environment offered by the usage of blogs made the members feel more satisfied and optimistic about the project outcomes and the blog team strongly felt that the resulting cookbook was of a higher quality as evident from the Q-sort results and responses to the survey question (Q5). The email team however, had a much lesser level of satisfaction and were less optimistic about their project outputs (cookbook). This can be attributed to greater communication, trust and mutual understanding in the blog team, a synergy which is highly desirable in a VT environment.

Email usage in virtual teams however, improves different aspects of TMS such as team cohesion which is highly essential for a great virtual team. This further lead to 'the current status of the project' being more visible to the team which is highly essential as team members need to have a clear picture of where their efforts are leading the project to.

There were certain interesting outcomes as well. The blog team members felt that they would like to use blogs as a communication tool if they were the project manager whereas the email team members weakly felt that they would like to use the communication tool (email) if they were the project manager. The researchers believe that this feeling of 'suitability' of a virtual team communication tool came because of the overall experience with the tool and was not dependent on performance grounds: Both the teams agreed that no information was lost and there was no information overload during the whole project, a finding which also distinguishes both these tools from traditional group support systems which suffered from information overload (Grise & Gallupe 1999/2000) but, there was a disorganization of information in the blog as indicated by the Q-sort findings. This finding has implication for managers considering the use of communication tools for their VTs. Team Management is an essential ingredient that leads towards building up a successful and effective team (Piccoli & Ives 2003). From a management perspective, blog use can ensure better team management and from an organizational perspective, blog use can improve virtual team efficiency, effectiveness and performance and can reduce company costs associated with performance management. Finally, this research is of value to the virtual team managers, practitioners and researchers as they can now consider blog usage while deciding upon a 'suitable' virtual team communication tool.

7 CONCLUSION

There has been minimal research on the usage of blogs in a virtual team environment and most of the previous literature focussed on virtual team communication tools such as email, phone and video conferencing. Unfortunately, none of the studies gave a concrete idea about the capacity of blogs to impact virtual team performance. This gap in literature consequently formed the research question for

this study. This research attempts to fill the gaps in the literature and the findings are hence, novel. The most significant finding of this research is that blogs give users a sense of fun and individual satisfaction which was much lower in the email team. Our finding is very much in line with the previous literature on virtual team satisfaction (Curseu et al. 2008; Shachaf 2008), which is an important element of a virtual team. An improvement in team performance was seen during this research as anticipated in the beginning. Team cohesion levels were not significant in the blog team as anticipated and this was due to the simplicity and small scale of the research that we conducted. The quasi-experiment methodology had limitations as the project was not a real-world project which is expected to have a much higher degree of complexity and hence, the team performance in both the cases would have been more suitable to adjudge. Further, the levels of motivation of team members would have been different for a real-world project due to the higher incentives they would get. This research experiment struggled to draw a large number of participants in a short period of time primarily due to the lack of these incentives such as salary, bonuses etc. However, when conducted on a large scale, the results could have been more clear and distinct. This preliminary research has definitely contributed to the existing knowledge about blog usage in virtual teams and is a starting point for future research. This research has practical relevance for managers considering the use of blogs in managing and co-ordinating their virtual teams across various industries. Further research in the area could focus on large scale and real world projects. Researchers may also consider the additional blog options such as podcasts and RSS feed to measure the effectiveness of blogs.

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