Journal of Information Technology Management

ISSN #1042-1319

A Publication of the Association of Management

EXPLORING BLOG USAGE IN VIRTUAL TEAMS: DISCOVERING SOCIAL MEDIA UTILITY

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ABSTRACT

The purpose of enquiry is to study how virtual team members perform their task when using a blog tool. This paper details the results of a quasi-experiment conducted between two virtual teams to create an online cookbook, one using a blog tool and the other, email. The primary data was collected in the form of a 27 statement Q-sort, the project artefacts such as team communication and a survey questionnaire. When measured in respect to Transactive Memory System (TMS), the blog team had a better developed TMS since, they were highly optimistic about the project outcomes, and knew their team members well after the project. The blog tool also encouraged improvements in task completion, task quality, member satisfaction and member commitment.

Keywords: Blogs, Computer-mediated communication, Email, Social Media, Virtual teams, TMS (Transactive Memory System), Team management, Q-methodology, Q-sort, quasi-experiment.

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" [2, 5]. Virtual teams (VTs) allow an organisation to bring in experts that it cannot afford to have permanently on the payroll. This provides great flexibility for the composition of the project team and sometimes, due to foreign country cost structures, it can be a more cost-effective option [32].

This research aims to shed light on the use of blogs as a VT communication tool. While there is a plethora of communication and collaboration tools available, prior research [7, 25, 39, 40, 42] suggests email, videoconferencing, wikis, blogs, instant messaging and phone as useful tools for VT communication. Prior research also investigates collaboration systems [17] to support distributed team work. Ou, et al. [34] studied the effect of instant messenger, email and knowledge forums on work performance. There is however, little research

into how blogs might be used in the workplace. A blog is potentially useful for creating a central repository for the project documents, tasks, discussions, status updates etc [33], which can be useful by VTs. Blogs are mentioned in the literature as a way to broadcast information [7], or to interact with customers [42]. A blog has advantages of built-in searching, filtering, sorting and categorising posts from the management dashboard; these advantages make information management easier as blogs keep everything in one place, and avoid information clutter and overload [16]. While these features are very useful to the VT, the researchers could not find evidence regarding the use of a blog as a central communication tool for VT projects, and therefore this formed the motivation for this research. Specifically, this research will determine whether project deliverables may be improved by using blogs. Hence, the research question for this study was:

RQ: *Can blog usage improve the performance of virtual teams?*

The objective of the research is to explore blog use and its advantages when used as a VT communication tool. This research expands our understanding into how blogs might be used in VT projects and uncovers some 'social' aspects that come into play. Transactive Memory System [45, 44] and its components of specialization, co-ordination and credibility [24, 20] is used to compare and contrast VTs using blogs and emails.

In the next section, a literature review highlighting the volume of research about the different aspects of VTs and an explanation of the theory of Transactive Memory System (TMS) is presented. Following this, the methodology adopted for this research is described, and the research findings and implications are discussed. The article concludes with a summary, an explanation of the paper's contribution and some recommendations for further research.

LITERATURE REVIEW

Bergiel, et al. [6] suggest "*In today's competitive global economy, organizations capable of rapidly creating virtual teams of talented people can respond quickly to changing business environments. Capabilities of this type offer organizations a form of competitive advantage*".

There is significant research on management of virtual teams. Some look at the early stages of the VT formation [4, 37], where more effort is focused on trust-building. Other literature [20, 14, 23] focuses on the manager's ability to articulate the milestones and goals clearly. The literature also explores whether the manager provides adequate and appropriate feedback [4, 6, 35] to the team members. Many of the normal team management activities are the same for VTs but they need to be done with extra vigilance as there is no visual feedback to give early warning of trouble [15].

Synchronous meetings may be scheduled at various times to accommodate team members in different parts of the world, or to "share the pain" of inconvenient times [6, 7, 30]. This helps in building the feeling of 'we are all in this together equally', rather than certain members feeling that they are the only ones making sacrifices [28]. Asynchronous meetings could lead to irregular communication, which greatly hinders trust [22]. Once trust had eroded sufficiently it is difficult to rebuild, and team work outcomes deteriorate [41]. A daily status post enforces peer pressure [28], and becomes what Ajzen [1] refers to as, 'a subjective norm'.

Although communication between VT members is important, it is equally so between managers and team members. Miscommunication can undermine trust [37] and can have a negative influence on the TMS. If the team management can communicate openly and clearly with the VT members, the levels of team trust are likely to remain high.

All VTs have electronic communication that keeps them together. Many teams use several forms of communication at once, but the researchers discovered that, although the literature [2, 14] has covered many different types of communication tools, there is very little research on the usefulness of blogs for the work of VTs. For example, blogs are mentioned in relation to a collaboration tool with customers in [42, p49]), but were not the primary subject of the research. Similarly, Brown, et al. [7, p3] suggest that blogs are useful to distribute information to team members and others. There is minimal research that directly addresses the use of blogs as collaborative, information classifying, sorting, and ordering tool for VTs and VT projects.

Transactive Memory System

The term "Transactive Memory System" (TMS) was first coined by Wegner, et al. [44, 45] and it improves upon the existing theories of group mind which were superseded by organisational psychology theories. A team is thought to consist of individual memory systems that reside with individual team members. A transactive memory system refers to the interconnection among these individual systems, and can be understood in terms of how these individual memories are shared and united through the processes of communication within the group. A widely accepted view of TMS as suggested by recent literature is "*A TMS refers to a specialized division of cognitive labor that develops within a team with respect to the encoding, storage, and retrieval of knowledge from*

different domains" [44 cited in 13, p856]. A TMS can be related to the subjective understanding of the team members and the team as a whole.

TMS impacts the performance of a team: a well-developed TMS is the mark of an effective team [13, 20, 24, 44]. Effectiveness of such teams relies on the development of an 'internal memory' that accounts for ease of task coordination and raises the performance of the team. A TMS is able to create a responsive team which can be adapted to a variety of situations and can be suited for a variety of tasks. The team members know each other's strengths and skills well, creating a bi-directional flow of knowledge. A TMS has three major components: specialization, coordination and credibility as described in Table 1.

Table 1: Transactive Memory System

TMS Component	Explanation	Outcomes
Specialization	Accurate team member-task pairing. Right skill set for a particular task. Team members know each other's expertise [28].	Raises the team's satisfaction levels [29] Critical for team performance [14, 37].
Co-ordination	A good co-ordination is needed in VTs [39]. Team members can seek help from the right 'expert'.	Team becomes more 'knowledgeable'. Team satisfaction is boosted [29].
Credibility	Ensured with specialization and co-ordination. Team develops expectations and mutual understanding [36]. Reduced miscommunication in the team [37].	Increased team performance. Increased task commitment [28]. Mutual understanding leads to development of trust [4, 37].

Correctly matching the specialisations (skills) of the team members with the tasks increases team satisfaction and this in turn leads to higher team performance. Previous research [14, 29, 37. 29, p1033] further states that that correct specialisation leads to, "…improved work outcomes, increased job satisfaction, satisfaction with personal growth and worker motivation".

The co-ordination aspect is vital to a well performing VT, so that work done by one member is not holding up another or two members, is not completing the same work, or wasting strengths and weaknesses, hence maximising the VT efficiency [20, p333]. Toward this end, using the blog tool for collaboration is an effective method of coordination and communication [18, 38].

With strong specialisation and good co-ordination among VT members the third aspect of TMS, credibility, can be achieved. Credibility is ensured in a VT when the team members do what they say and what they are expected to do [24]. Team members know that they can rely on each other to achieve the allocated task. This further enhances team trust and cohesion and creates a high performance VT. Trust builds with within a VT on account of credibility which is very important [4, 37] for the team.

Trust, which is closely related to credibility, is also a common theme in the VT literature [14, 20, 22, 35, 41, 43], and is also an important element of a TMS, [13, 20, 23, 24]. Accordingly, great teams have greater levels of trust, possess a better developed TMS, and are able to co-ordinate tasks well, as they are aware of the strengths and weaknesses of their team members. Teams with more trust and a well-developed TMS are able to more quickly solve problems thus getting more work done [24, 13]. Work done by Huang, et al. [21] looked at different TMS dimensions in addition to the main three mentioned here. They used knowledge quality and perceived knowledge satisfaction as additional constructs with moderating ties to shed light on the complex dynamics of VTs. This contrasts with our research approach which uses Q-sort (See Appendix 2) methodology to allow the strongest 'feelings' to show themselves between the two teams.

In theory, blogs should support specialization since the many tools available in a blog environment support the matching of team members to the various tasks to be undertaken in a VT project [38]. Blogs also impact coordination in VTs through the availability of features that support collaboration among the team members, such as scheduling, or the formation of a

community [18] of experts to lead towards cooperative decision making [11] for the benefit of the team. Blogs are also theorized to increase the credibility shared between VT members on account of reduced miscommunication resulting from stronger team ties [12], and increased team trust.

RESEARCH METHODOLOGY

The gap in the literature and lack of frameworks about how blogs may affect virtual team communication and performance formed the starting point for this research. Although TMS is loosely adopted *a priori*, the researchers pursued an exploratory approach based on TMS theory as detailed in Table 1. Primary data collection was accomplished using the q-sort methodology, and an evaluation of VT project artefacts and communications.

Participants

Potential participants were identified based on the researcher's personal and professional contacts, and were sent an information sheet detailing the specifics of this research (e.g. purpose, method, times etc.). Participation in this research was voluntary and no incentives were offered to the participants. The participants had an option to withdraw from this research at any point in time. Finally, eight participants were recruited and were split into two teams of four members each. All participants had prior experience of working in virtual teams. The researchers ensured that the participants within each team had not met each other before. The researchers also ensured that both the teams exhibited the 'characteristics' of virtual teams: the team members were based in different locations, teams had an element of cultural diversity, and all participants possessed a technical familiarity with the use of blogs and email. Table 2 reports the location, occupation and nationalities of the participants.

Table 2: Profiles of the Participants

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

Procedure

Given the goals of the research to examine blog usage in VTs, and the exploratory nature of the research, a quasi-experimental method [10] was implemented. Two experimental groups were formed, one that used email to coordinate their work, and the other using a blog to coordinate their work. The "blog" group operationalized the experimental condition, and the email team operationalized the 'control' condition of this quasi-experiment, on account of the near-universal adoption and familiarity with using email for coordinating project work and time zone differences in the blog team. Each team was instructed to create an 'online cookbook' as the experimental task. The study duration was 5 days, during which the team members were asked to work for about 15 minutes a day, and strictly instructed not to discuss this research with anyone outside their team. The cookbook was required to have ingredients, a photo, and method for cooking a particular dish. The participants were given a 15 minute time for composing their entry in the menu only and were allowed to source items from the internet (e.g. ingredients, photos, method etc.) since, the researchers felt that 15 minutes per day might be a little tight to carry out all the tasks simultaneously. The activities under this research were categorized as 'communication' and 'outputs'.

Communication: One team, the 'email team', was directed to communicate through personal emails to coordinate this project and the other team, the 'blog team' was given a blog tool for communication. The blog team's blog tool was hosted at www.wordpress.com and had the communication features common to blogs, such as likes, comments and posts. The blog tool offered features to enter the information in several pre-defined categories: 'Status Update', 'About Me', 'Questions', 'Info' and 'Instructions'. 'About Me' post was designed to get the

team members socializing by putting their photo etc. onto the blog. A post under any of these sections could facilitate a discussion through addition of comments. Any post made by the team members was time-stamped to ensure information ordering in a chronological manner. Following the setup of the blog tool, member accounts were created on WordPress to enable them to use the tool. Each member was asked to provide a unique email address to receive an email from Wordpress containing an account confirmation link. The members were then asked to click on the confirmation link to create their accounts on Wordpress tool. The communication time was on top of the 15 minute time that was allocated to team members from both the teams. The blog tool provided an environment to satisfy the operational definition of a TMS: the team members were specialized and could co-ordinate well to enforce their team's credibility through the blog tool's features and monitoring the content.

Experimental task: The cookbooks were hosted on the internet at www.wordpress.com. Both of the cookbooks (one for each team) made use of the 'pages' section of the free Wordpress blog tool. This free hosted tool had the latest Wordpress version which included a new 'like' feature. Each site for creating the cookbook was setup with pre-defined menu pages: Cookbook, Soups, Entrees, Vegetables, Meats and Desserts, in order to allow the team members to place their recipe under the correct parent page. The blog team's site also had instructions on how to complete this project, while the email team had their instructions emailed to them. All team members were invited to their site with clear instructions on how to setup their accounts. All team members were assigned an 'Editor' role as opposed to 'Author' or 'Viewer' so that they could create, edit and comment in any of the pages on the cookbook.

Instrumentation

A 27 statement Q-sort was designed to capture the experiences of the participants during the entire project. All the Q-sort statements were created from the relevant literature and were tailored according to this research with the help of expert advice, and the researchers' judgement as the project progressed, in accordance with established protocols for the use of q-sorts [8, 46, 47]. At the completion of the project all the participants were asked sort these Q-sort statements according to their 'project experiences' with the method of communication, blog or email. Participants were instructed to sort the statements 'from the outside in', that is, to choose two statements that they agree with the most and the two that they disagree with the most and put them in the extreme categories. After this, they were required to choose three statements that they 'agree' with and the three that they 'disagree' with and put them in the next categories. Finally, the participants were required to select 5 statements that they 'somewhat agree' with and five that they 'somewhat disagree' with and put them in the middle. Any unranked statements were entered into the 'neutral' category. The participants were asked to sort the Q-sort items according to how they felt about their communication tool for 'This Project'.

Analysis

The data was analysed using a form of factor analysis that is prescribed for q-sorts [8], using the PQ-method software, which is widely preferred in Q-methodology research [9]. PQMethod produces, among other things, between-factor correlations, rankings of q-statements by factor, statements ranked by consensus and disagreement between factors, and the factor loading of each person on each factor, with indicators for factor "exemplars" - persons who exemplify the priorities of any particular factor.

Additional Data

A short survey (See Appendix 1) was also completed by the participants. The survey had 8 questions on which the respondents rated their agreement/disagreement on a scale of 1-7. The survey also provided an opportunity for the respondents to optionally comment on each question. The number of comments was surprisingly high as 7 people answered the 8 questions and wrote a total of 23 comments. This data revealed interesting asides such as how the users felt about their communication tools.

RESEARCH FINDINGS

This section presents the findings of this research that were reached through the analysis of the Q-sort data and the cookbook grading that was done by the authors.

Q-Sort Results

In order to interpret the Q-sort data, the authors performed a centroid factor analysis [46, 47] and used 2-factor and 3-factor solutions. However, since the 3-factor solution converged back to the 2-factor solution, it was discarded. Table 3 reports the 2 factor solution matrix, with X indicating the "defining sort". One of the distinguishing characteristics of Q-methodology is the use of the person x person correlation matrix for factor analysis, as opposed to the variable x variable correlation matrix used in the more common forms of factor analysis.

This means that factor scores apply to the person, rather than the variable [8, 46, 47]. The 2-factor solution (Table 3) shows that all members of the blog team are characterised by factor 2 and the email team is characterised by factor 1, which indicates a 100% agreement between the quasi-experimental treatment and the results of the factor analysis.

Table 3: Factor Matrix with X Indicating a Defining Sort

Team	Person	Factor 1	Factor 2
Blog	Ucname22	0.5291	**0.6255x**
Blog	Ucname23	0.2483	**0.6176x**
Blog	Ucname24	0.4258	**0.5132x**
Email	Ucname44	**0.7699x**	-0.3618
Email	Ucname45	**0.5801x**	-0.4232
Email	Ucname46	**0.7336x**	-0.0779
Email	Ucname47	**0.8308x**	-0.1464

Table 4 shows the ranking of Q-sort statements and their z-scores for factors 1 and 2. Statements numbered 26 and 10 were the top two for the email team while, statements 4 and 21 ranked highest for the blog team. Factors 1 and 2 are understood as "types" of participants according to their perspective on team communication and activities while they worked in virtual teams that were created for the purpose of this research. The research findings reveal that Factor 1 (Type 1) is characterized by a sense of control and effectiveness of the project activities and represents the email team. This can be interpreted by the top three ranked statements for factor 1: "the current status of the project was easily viewed", "problems were quickly resolved" and "my voice and views were easily heard". Factor 2 (Type 2) represents the blog team and is strongly characterized by a sense of satisfaction with the task, personal satisfaction in terms of having "fun" apart from the project work and a sense of optimism in the work approach. The top three statements for factor 2 are: "I experienced a sense of fun", "the resulting cookbook/project was of a high standard " and "I experienced individual satisfaction ".

Table 4: Q-sort Statements with Their Corresponding Ranks and Z-Scores

			Type 1		Type 2	
No.	Statement		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 reports the Q-sort statements that differed most in their z-scores between the email team and the blog team. The positive values on the difference are the statements that the email team had prioritized more than the blog team while the negative values for the difference in z-scores indicate the statements that the blog team had prioritized higher than the email team. For the email team, the statements that were significantly different from the blog team are: 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". For the blog team, the statements that were significantly different from the email team as reported in table 5 are: 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 and contrary to what the authors expected, the statement that the blog team differed the most with the email team on was: "It suffered from disorganisation of information". With regard to this, it should be noted that the blog team rated this as only somewhat characteristic, whereas the email team rated this very uncharacteristic of their VT experience. It may also be attributed to the small time frame in which the project was carried out.

Table 5: Descending Array of Differences Between Factors 1 and 2

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

Despite having differences in priorities, there were certain statements that represented both the blog and email teams. Both the teams felt that they worked as a team, team members trusted each other and had access to a reliable communication tool. These statements are important to establish that there was little or no bias in the teams related to the allocation of team members that do not co-ordinate well or perform their assigned task, leading to problems during the project and reflecting back on the perceptions of the team members about their team. Based on the absence of bias, the comparison between the email and blog tools is judged to be "fair" and not biased on these grounds and that the project outcomes, team work and team performance strictly refer to the difference made by the communication tool in the work ethic of both the teams.

All the statements can be seen as different priorities or aspects of the teams as seen by the individual team members. The Q-sort results clearly indicate that there was a sizable difference in their approach to work as

reported by both the teams. The blog team was optimistic about their project outcomes, felt confident about their team trust and were satisfied on the personal front. Both the teams therefore developed a different "team culture" and exhibited a different work ethic. This can be attributed to the work environment offered by the communication tool (blog and email) and independent of any other factors, since the team members had not met each other face-to-face and did not know each other before the project commenced. This leads to a conclusion that blogs "felt" different than email as far as the task is concerned and can lead to a significant difference in project outputs in a real business project.

Cookbook Grading

The Q-sort responses discussed in the previous section were "self-reported" by the participants. In order to adjudge the performance of the teams, the authors felt that it was essential to assess the final project outcomes (resulting cookbooks) and the communication counts between the team members that demonstrate the extent to which the team members worked together as a team. Firstly, the cookbooks were examined by the authors and graded using a reliable cookbook guide [26]. It is worthwhile mentioning that while the experiment was being conducted, one blog team participant chose to withdraw, hence, the scores have been scaled accordingly to ensure a degree of fairness in the project results. As suggested by [26], the cookbooks were graded along six 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 cookbook grades were nearly similar, 6.63 for the blog and 6.7 for the email team. The researchers closely reviewed the cookbooks and looked at the communication counts (Table 6) between the project teams, since it was not suitable to judge the team performance based only on the project outcomes as suggested by previous Group Decision Support System literature[27].

Table 6: Communication Counts Among the Team Members

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

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.

DISCUSSION

This research aims to give some insight into how a blog might be used as a communication tool on a VT project. It attempts to answer the research question, 'Can blog usage improve the performance of virtual teams?'. The researchers found no detailed study of blog usage in VT projects and felt that the best way to explore this was to create a quasi-experiment [10], where 2 teams worked on an identical task. One team communicated using the blog tool while the other team used email. It was expected that the final output of the task would show differences, and along with other project artefacts and collected data, be able to shed light on the teamwork of both teams.

The findings were not as initially expected. The researchers expected a better outcome from the blog team as they had a more advanced collaborative tool [33] compared to using email. However the results of the cookbook evaluation were nearly the same. The researchers believe that the most likely reason for this was that the project was too simple and short in duration to uncover any significant variations between the two. No loss of information or information overload was reported by the teams, which distinguishes blog and email tools from traditional group support systems that suffered from information overload [19]. However, the study did identify differences in how the teams worked, how they felt about their team-mates and the project, their levels of communication, and their communication characteristics.

Specialization: Specialization [13, 20, 24, 44] is understood as matching members' skills to the task at hand. This in turn leads to higher levels of satisfaction. Satisfaction is critical for a virtual team performance [14, 29, 37]. The email team seemed to have skills more closely matching the required task. The researchers attribute this to the members being software developers and to their familiarity with a wider range of software tools. However, even with this advantage the email team was less satisfied. An analysis of the Q-sort results clearly shows that the blog team experienced a greater 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 a greater sense of satisfaction. It is also possible that the email team, given their experience as software developers, should have outperformed the blog team, if not for the blog team's use

of an advanced collaboration tool. In other words, the blog tool may have made an un-even match quite a bit more "even".

Team satisfaction led to a feeling of 'fun' in the blog team which is another interesting finding of this research. This is evident from the Q-sort results as the statement "I experienced a sense of fun" was ranked higher (1) for blog team, but only ranked 12th for the email team, with the survey responses for question 8 (Overall was the project an enjoyable experience?) supporting this view. The researchers believe that in a real business project, blog usage would lead to a greater commitment to the task and would significantly improve motivation levels of the team members. This is likely to lead to a better team performance [34, 31]. As a valuable addition to Ou, et al.'s [34] study, this research points to the role that blogs can play during work time, suggesting that social media has a "significant positive effect on job performance through the mediation of job satisfaction", which consequently improves virtual team performance.

Co-ordination: Team co-ordination is another important element that contributes towards building great virtual teams [13, 20, 24, 37, 39, 44]. Co-ordination is reached by effective communication between the team members [48] 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 message counts. The researchers conclude that blogs tend to increase communication in VT projects.

Virtual team co-ordination is also affected by team cohesion, as suggested by the literature [37, 39]. 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 believed more strongly that they did not need more synchronous communication (eg. videophone, phone etc.) whereas the email team felt somewhat less strongly about this.

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 viewed' which is in contrast to the blog team's perceptions. The researchers conclude that while the email team felt they had a greater degree of team co-ordination than the blog team, this may have been due to the simplicity of the project, and/ or the advanced skill levels of the email 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. On reflection, the researchers think that this can be attributed to the simplicity of the project and the fact that the blog users had to learn and adapt to the blog tool for communication while the email team already knew how to use email. The researchers believe that on a more complex project the email coordination would be less effective. This simple project allowed the email team to sort out at the beginning 'who' was doing 'what' and then work independently on their tasks without further coordination. Similarly they could see progress easily by comparing the completed pages with the scheduled pages to see the current status of the project.

Credibility: Credibility is affected by specialization and co-ordination and is the final ingredient to building up a successful TMS and virtual team [13, 20, 24, 44]. Credibility leads to trust, mutual understanding, and reduction of miscommunication in a team.

The Q-sort findings show that the blog team had developed a strong feeling of trust [4, 28, 37] amongst themselves but the same was not felt as strongly in the email team. The blog team enjoyed greater mutual understanding [28, 34, 36] among their team members than the email team. The blog team members felt that the others knew them well, that is, they had provided sufficient information about themselves. The email team, on the other hand, felt less strongly about this. This finding is also confirmed by the survey results (Q7), which indicate that the blog team knew more about the other members than the email team. This finding is in line with Ou, et al.'s [34] finding that social networking tools aid in one-to-one relationship building among the team members.

The blog entries used more pictures and tend to attract likes and comments from the team members and initiate a conversation. It is clear from these 2 representative samples that the blog environment lends itself much more favourably to social interactions, which in turn, encourages relationship building, cohesiveness and boosts team spirit. As noted in the literature [13, 20, 24] to create effective teams, members need to build trust and credibility between themselves; this is greatly aided by social interactions as seen in the case of blog team. Consequently, it is much easier to feel empathy for someone who you know more about.

In summary, 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 achieved 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 output of the project

was the same, the blog team enjoyed a different team culture and work ethic than the email team. As mentioned previously, it is also possible that the blog team may have been expected to under-perform the email team, if both teams had used email for their project. The inability to determine this is, in fact, a limitation of this research. 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 lower 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.

The final output (the Cookbook) was not the only research outcome, the Q-sort results clearly show differences in teams' attitudes toward the project and their fellow team-mates. The email team had a much more utilitarian viewpoint i.e. let's get on and finish this project. While the blog team had a much more social and nurturing environment, this was helped by the 'Like' feature on the blog as it is easy to give encouragement with just one click. Furthermore this encouragement is seen by all members and starts to become the normal way of team interactions. On the other hand, email may achieve the same thing, albeit with a bit more effort. The two main findings from the Q-sort analysis are that the blog team reported they, 'experienced a sense of fun', while the email team's strongest statement was 'the project status was easily viewed', which epitomised the nature of the overall team work. The other findings such as communication counts support this assertion. A comment from a member of the email team – 'The first couple of days were quite fun, the rest was more of a chore than an enjoyable experience.' further reinforces the value of social interactions.

CONCLUSION

This research has contributed to the knowledge on blog usage in a VT project environment. It has shown how blog use for VT communications can nurture social interactions, improve the work culture and performance of the virtual team, and facilitate the formation of a VT transactive memory system. This research extends the work of previous researcher [17, 34] about blog tools and adds value to them. Through the Q-sort data, this research has shown the clear differences a tool can make in shaping the team culture and ethic and members' attitudes towards the project.

VT managers can explore the use of communication tools that encourage social interactions as this strengthens team cohesiveness, engagement and trust. This research used a blog tool and showed how useful it can be in a VT project situation. In the longer run, this can lead to improved communication, team co-ordination, team satisfaction and improved team performance. This research also showed that blogs create a central repository of project artefacts (instructions, questions, design documents etc) and communications, thus reducing the information overload and clutter found in the case of email. The built-in filtering, ordering and categorising of the blog makes the VT manager's reporting job easier. Finally, the blog tool leaves a valuable history of project information and communications behind after completion of the project which is also useful for managers.

The research used a small number of participants and the project task was quite short, which were the main limitations of this study; the researchers' feel that a real world project may clearly be able to show the distinction between blog and email tools. Another aspect was unfamiliarity with the blog tool, as some members didn't use it to its full advantage and would have benefited from some training, and perhaps from a 'live' chat feature.

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APPENDIX 1

Table 7: The Results of the Survey Questionnaire

	Blog group				Email Group				
Question	ucname022	ucname023	ucname024	**Average**	ucname044	ucname045	ucname046	ucname047	**Average**
1	3	4	2	**3**	2	2	1	1	**1.5**
2	2	3	1	**2**	2	1	2	2	**1.8**
3	3	2	1	**2**	1	3	3	2	**2.3**
4	5	3	4	**4**	6	4	6	4	**5**
5	6	6	5	**5.7**	5	5	5	4	**4.8**
6	6	5	5	**5.3**	6	5	7	4	**5.5**
7	6	2	5	**4.3**	3	3	2	2	**2.5**
8	7	5	6	**6**	2	5	6	4	**4.3**

Table 8: Survey Questionnaire

Q1.Did you find the Wordpress tool easy to use?	Rating: easy 1 2 3 4 5 6 7 difficult.
Q2.Did you find the cookbook easy to make?	Rating: easy 1 2 3 4 5 6 7 difficult.
Q3. How easy did you find communicating with your team members?	Rating: easy 1 2 3 4 5 6 7 difficult.
Q4.Did you find collaboration with the other members satisfactory?	Rating: not satisfied 1 2 3 4 5 6 7 completely satisfied.
Q5.What was your overall satisfaction with the completed cookbook?	Rating: not satisfied 1 2 3 4 5 6 7 completely satisfied.
Q6.Did you feel your team was effective?	Rating: dysfunctional 1 2 3 4 5 6 7 very effective.
Q7.Did you feel you knew something about the other team members by the end of the project?	Rating: know nothing 1 2 3 4 5 6 7 know a lot about.
Q8. Overall was the project an enjoyable experience?	Rating: not enjoyable 1 2 3 4 5 6 7 very enjoyable.

Not all people answered the questions, ucname021 did not complete the experiment.

APPENDIX 2

Q-method is named from the fact that it is concerned with the person x person correlation matrix, as opposed to the far more common, classical "R" methods that are so-named for the Pearson correlation coefficient, "r". R methods are used when the researcher is interested in the correlations between tests for a sample of people. These variables are predefined by the researcher and their relative importance to the subjects' viewpoint is not captured. In a survey for example, each question is simply rated by the subject on the question's merits, the questions are not rated against each other. Q-method however, is useful in situations where the researcher is interested in correlations between people for a sample of tests. That is, it reveals commonalities in the peoples' subjective viewpoints.

Q-method was developed by psychologist William Stephenson in 1935. He wrote the definitive book, "The study of behavior: Q-technique and its methodology", on this research technique in 1953.