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Rosemary Stockdale

Massey University, New Zealand, r.j.stockdale@massey.ac.nz

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Collaborating in a virtual team; the challenges of purpose, people and technology

Dr Rosemary Stockdale
Bernhard Rieder
Sven Kühne

Institute of Information and Mathematical Sciences
Massey University
Albany, New Zealand
Email: r.j.stockdale@massey.ac.nz

MCA Management Consulting Agency,
Innsbruck, Austria
Email: b.rieder@mca-solutions.at
s.kuehne@mca-solutions.at

Abstract

This paper reports on the results of an ethnographic study of a virtual team project in the travel and tourism industry. Key elements that contributed to the team's ability to work effectively and gain benefit are identified and discussed within the context of the case. It was found that the caretaker/gatekeeper role of the project leader made a significant contribution to overcoming problems arising from project complexity. However, the lack of commitment to a range of information technologies heightened the reliance on periodic face-to-face meetings to provide an environment that supported team interactions.

Keywords

Virtual teams, collaboration, communication, people, technology

INTRODUCTION

Working in a virtual team is no longer a choice for many people in organisations. The growth of global commerce and higher levels of inter-organisational cooperation demand greater flexibility and collaboration within and between organisational work forces. Developments in information communication technologies (ICT) have contributed to the ability of teams to diverge from traditional methods of coordination and to operate in new and innovative ways. While there are many benefits to be gained from distributed working and enabling teams to progress projects from dispersed working environments, organisations face a range of challenges. In the early stages of research into virtual teams, field and case studies have provided insights into how organisations are facing the issues that they encounter (Kayworth & Leidner, 2000; Majchrzak, Rice, Malhotra, & King, 2000; Pauleen, 2003; Suchan & Hayzak, 2001).

Our paper contributes to this growing body of literature on virtual teams by identifying key elements that led to the successful completion of a virtual team project in the travel and tourism industry. We analyse the organisation and progress of the project from its inception through to completion and examine what factors impacted the team's ability to work effectively and achieve results. An ethnographic approach is used to examine the complexity and the challenges experienced within the multi-national, multi-organisational virtual team and identifies the positive and negative effects and how the interaction of project members contributed to a successful outcome.

VIRTUAL TEAMS

In considering the growing body of literature on virtual teams, we have first examined the meaning of what constitutes a virtual team before addressing the literature on the way such teams are structured. The constructs that contribute to the characteristics of teams are then identified, based on Powell, Piccoli & Ives' (2004) framework, which they derived from an extensive review of current literature. Finally, we have distilled the constructs to accord with the Simple Systems Model developed by Lipnack & Stamps (Suchan & Hayzak, 2001) to identify the three main components of the virtual team; purpose, people and technology. These then form the basis for the analysis of the case to enable identification of the factors that contributed or hindered the ability of the team members to deliver the project outcomes.

Definitions of what is meant by the term 'virtual team' are many and varied. We begin with a definition of a team from the management literature (Cohen & Bailey, 1997p.241):

A team is a collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems (for example, business unit or the corporation), and who manage their relationships across organizational boundaries.

To transpose this definition to the virtual world there are several well-cited, additional characteristics summed up in Jarvenpaa & Leidner's definition that includes ' a temporary, culturally diverse, geographically dispersed, electronically communicating work group' (1999 p.792). Powell et al., argue that the temporary nature of the virtual team is not a defining characteristic but rather a by-product of its reason to exist, but do not dismiss the idea of impermanence. Further debate on the difference between the terms 'team' and 'group' support the identification of meaning for virtual teams and are crystallised in Powell et al's (2004) distinction of defining features to include unity of purpose, identity as a social structure, and shared responsibility of members for the outcomes. To further complicate the terminology the terms *distributed team*, *dispersed team* and *virtual team* are used interchangeably (Lee-Kelley, 2006). The key identifier of a team as virtual is its use of information technologies as the linkage to support the project working together or indeed replace physical aspects of traditional team structure (Townsend, DeMarie, & Hendrickson, 1988).

In examining the organisation of virtual teams it may be possible to identify where new methods of coordination are viable and where they augment or replace traditional team based concepts. As Powel et al. argue, there is an assumption that virtual teams will adhere to "existing ways in which work is, or should be, performed" (2004 p.17) but there is no real reason why this should be the case. The idea of virtual teams being an extension of existing tradition ways of working is contained in Pauleen's (2003) argument that virtual teams are usually only partly virtual and that there is a transition between face to face and truly virtual teams. He uses the term 'transitional ICT-supported team' to refer to those teams that are increasingly moving from face-to-face to virtual communication methods (2003 p.2). Another concept is that of the 'integrated team' that also has many similarities to traditional team structure (Ramesh & Dennis, 2002). Coordination within integrated teams mirrors the traditional formats in that these teams rely on information rich media through synchronous channels. Ramesh & Dennis build on Mintzberg's work into teams to identify two forms of integrated team. In the first, mutual adjustment requires all team members to interact and synchronise efforts to maximise the expertise of each member. In the second form, the direct supervision model requires a team leader to take the responsibility of synchronising activities. Going beyond duplication of the face-to-face team structure to encompass more IT influenced characteristics, Mintzberg's remaining three categorisations are discussed in the identification of standardisation of process, of inputs or of outputs as the key coordination method of teams. They argue that this leads away from tradition ways of doing things to 'strikingly different ways of organising and coordinating work in virtual teams' (Ramesh & Dennis, 2002 p.7) akin to the object-orientated model of organisational strategy. A significant difference lies in the way these teams are decoupled, reducing the amount of information exchange by the use of semantically rich media such as knowledge repositories. The use of these repositories to support object-orientated virtual teams demands well defined processes and standardisation techniques to facilitate communication and coordination. This has implications for the management, organisation and the leadership of a project team that interacts mainly through information technologies. In a distributed environment the coordination of milestones and deliverables is complex. There needs to be commitment to the outcomes from each member of the team and a defined reporting structure if objectives are to be realised.

The advantages to be gained from the use of virtual teams can be extensive, particularly in a business environment that is increasingly global and competitive and where resources of leaner, downsized organisations can be maximised (Townsend et al., 1988). The potential for global collaboration and maximising the talents and resources within and between organisations are significant (Cascio, 2000). The unifying perspectives of working in a multi-cultural environment can underpin the increasing importance of the provision of services to global customers (Cascio, 2000; Townsend et al., 1988) and improve decision making and problem solving (Kayworth & Leidner, 2000). However, the dispersed environment makes virtual teams more difficult to coordinate than traditional ones and managers of such teams face a complex task to overcome this (Kayworth & Leidner, 2000). The use of information technologies supports communication, but requires greater understanding of how this affects relationships and cohesion of the team (Jarvenpaa & Leidner, 1999; Maznevski & Chudoba, 2000; Pauleen & Yoong, 2001). Other potential problems arise from such issues as cultural diversity, isolation and lack of trust (Begley & Boyd, 2003; Cascio, 2000; Jarvenpaa & Leidner, 1999) that must be addressed at an early stage and be well managed if the team is to achieve success.

Conceptual framework

We have remained consistent with previous work on virtual teams in using an input-process-output model to form the basis of our analysis of the case (Powell et al., 2004), but have related the key concepts to Lipnack &

Stamp's Simple Systems Model (Suchan & Hayzak, 2001) to aid clarity in the analysis of a complex case study. Figure 1 relates the three elements of the latter model (purpose, people and technology) to the concepts derived from Powell et al.'s comprehensive literature review.

Project input addresses the need to consider the context, design and cultural influences that determine the project characteristics and composition. These are strongly influenced by the purpose and goals for creating and using the virtual team as represented in the first of the three Simple System components; that of purpose (Suchan & Hayzak, 2001). The process element is divided into the other two components of people (socio-emotional) and technology (task). The former concentrates on relationships and the influence on cohesion and trust within the team while the latter encompasses the factors that emerge as the team works towards the outputs. Final outputs are considered within the context of effectiveness. We consider effectiveness here in terms of performance quality (i.e. quantity and quality of outputs) rather than member attitudes or behavioural outcomes (Cohen & Bailey, 1997) or satisfaction (Powell et al., 2004).

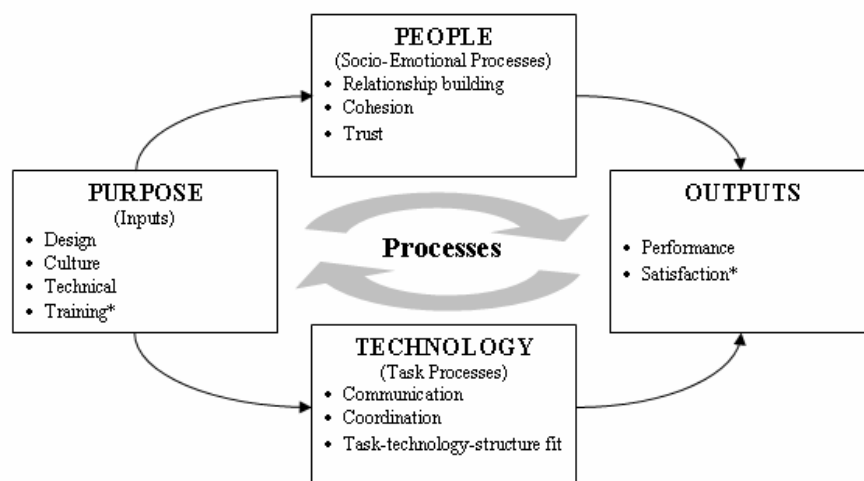


Figure 1: Conceptual framework (Powell et al., 2004; Suchan & Hayzak, 2001)

The concepts of training and satisfaction in Figure 1 are not directly discussed as no formal training took place in the project and satisfaction regarding outputs was not a consideration.

RESEARCH DESIGN

The research approach adopted for this study is based on ethnography. Ethnography 'deals with actual practices in real world situations' and enables deeper understanding of problems and issues within the social, cultural and political context of the study (Harvey & Myers, 1995 p.22). This requires a longitudinal approach with intensive involvement in the research context (Nandhakumar & Avison, 1999) and supports the exploration of particular issues that arise from the contextual situation (Harvey & Myers, 1995). A rich understanding of the data enables the testing of the case against virtual team theory and supports identification of key issues in the structure and complexity of working in virtual teams.

Data collection and analysis

Data were collected using the participant observation approach where the researcher gains data through direct contact with the case such as being a member of the team (Nandhakumar & Jones, 1997 p.115). The authors worked within the case context for a period of 11 months, although only one author had face-to-face contact with members of the project team. Data were collected from:

- Ethnographic observation of five face-to-face project team meetings
- Questionnaire surveys of team members. The questions referred to members' satisfaction with the development of the project, asked for input for future development plans and feedback on technical aspects of the software system being developed. Questionnaires to the key project members were emailed out at the 6 month point. Project members piloting the software (WP 4) were surveyed every month.
- Interviews with team members. These were unstructured and informal and in all but two cases were face to face. The exceptions were telephone interviews.
- Weekly meetings of the researchers where an informal review of the project was ongoing and recorded in written notes.

- Project documents (available from the project knowledge base) and emails.

As is common with interpretive research, the data analysis was ongoing during the data collection period. We became familiar with the documents and the ongoing development of the virtual team. This enabled us to record impressions and discuss developments at a weekly meeting where notes were recorded that, in essence, formed a research journal.

The data were coded systematically using the concepts identified in Figure 1 to identify where the case met or diverged from the literature. An iterative approach was taken to the data analysis as we discussed, cross checked and re-evaluated our individual take on the coding during the weekly meetings. This organic approach supported the identification of recurring themes that tested the original identified concepts and enabled us to recognise where the data sources confirmed or conflicted with the framework.

THE CASE STUDY

The case study reports on a multi-national, multi-organisational project in the travel and tourism industry. The project included 30 companies and organisations across Europe and involved more than 60 persons. The project was funded by the European Union (EU) eTEN programme (electronic Trans-European Networks) and its objective was to carry out a market validation of the results from an earlier prototype development project. The travel and tourism industry was an early adopter of IT to support its complex supply chain and need for rich information exchange. This has led to a dispersed and complex technological environment with few established technical standards and cumbersome methods of data exchange. The objective of this project was to address the interoperability problem through the development of an ontology management system, based on open source software.

Although the project was EU government funded the context and project management processes were subject to established project design considerations. For example, the project management were responsible for establishing budgets, milestones, reporting structures and deliverables which can be compared to business projects with a similar dimension. EU funding imposed rules on the submission of the outcomes and on the broad framework of how the funding could be spent that the team considered analogous to other inter-organisational projects.

The project was divided into six work packages (WPs) with specific members, tasks and goals. Milestones and deliverables were defined in a time plan for the one year project. The sixth WP related to the management and coordination of the project. It had two members, consisting of a project leader and a project manager, who were responsible for coordination of the other work packages and for supervising the whole project including specific tasks such as quarterly monitoring reports, periodic progress reports and cost statements. Figure 2 gives an overview of the work packages with a short description of the deliverables and the main topic focus (T = technical; B = business). Each work package had a manager who coordinated the WP team and was responsible for meeting milestones, presenting reports and final WP outcomes.

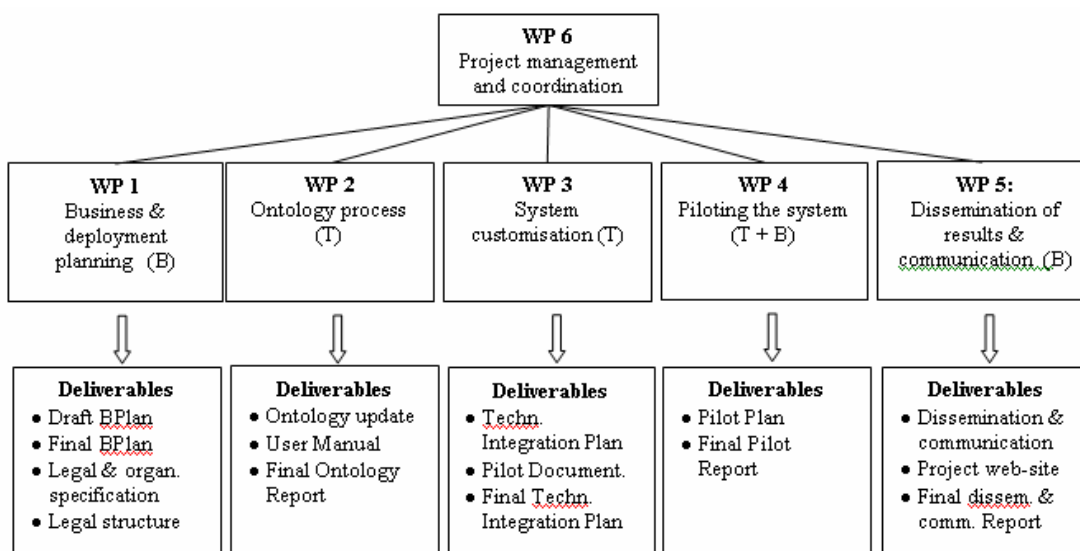


Figure 2: Project Work Package Structure

In addition to the WP teams there were several members of the project who retained an advisory role. These members were representatives of major tourism organisations such as the World Tourism Organisation and the European Travel Commission and contributed advice and in some cases, continuity having participated since the

beginning of the preceding software development project. There was a very fluid element to the structure of the teams as people were appointed by their organisations rather than as individuals.

THE PROJECT – FINDINGS AND DISCUSSION

The progress of the project is discussed from its beginning to the final outcomes. Although we have used the conceptual framework to analyse the data, the findings are discussed in a less structured context. This accords with Harvey and Myers (1995) contention that the holistic nature of ethnographic studies is more suited to a story-telling approach in preference to the more traditional 'hypothetico-deductive approach' (p.11) common to information systems.

Purpose

The element of purpose, as seen in Figure 1, describes a team's common aims and the concrete measures that are put in place to coordinate, communicate and contribute to project effectiveness (Suchan & Hayzak, 2001). We have used the construct of design within this element to discuss the structure of the team and leadership of the project. These are seen as defining elements of the context that affected the people and the use of IT within the team. The concept of culture includes diversity issues that were found to impact the project outcomes.

The structure of the team

The membership of the project was determined by the context of the preceding development phase project; also set within and funded by the EU. This meant that the team network was spread across EU countries and included both national and regional organisations. The nature of the tourism industry also contributed to the context, as this sector is characterised by a high number of smaller businesses, national bodies, and umbrella organisations that represent a diverse and multi-cultural supply chain. Common industry interests, strengthened by the tight interdependence of the stakeholders, contributed to a greater degree of unity than is perhaps normal in a multi-organisational project, although the degree of interest varied between the different bodies and between their representatives.

In considering the structure of the team, we came to designate it a dispersed team rather than a virtual team as the use of IT for communication was limited and dominated by email. This accords more with Pauleen's (2003) argument for partial virtualness than with the concept of new ways of working (Powell et al., 2004). The work package design and the standardisation of outputs would suggest that the object orientated model proposed by Ramesh and Dennis (2002) would provide an innovative structure. However, the project failed to promote or establish a semantically rich media for information exchange and the opportunity to use a forum was not taken up. The consensus of members was that the team was in transition from traditional to virtual (Pauleen, 2003) and depended on face to face meetings backed up by email rather than striving to benefit from IT capabilities.

Leadership

The role of the project leader was deemed by WP leaders and stakeholders to be a key element in the meeting of deadlines and the eventual success of the project. The function of the leader mirrored the key attributes of the caretaker role that has been considered to greatly benefit virtual teams (Kayworth & Leidner, 2000). Caretaker tasks concentrate on the sharing of information within the team through the support of 'regular, detailed and prompt communication' (2004 p.18) and managing roles and responsibilities within the project. The coordination of the work and bringing the very different work teams together was a difficult task, and work package leaders believe that the project leader was key to the achievement of milestones. The role of leader is a common one in EU projects and encourages a certain amount of specialisation of leaders capable of steering virtual teams through the labyrinthine passages of a complex governmental system. Empirical evidence of the attributes of good virtual team leaders is in short supply (Hertel, Geister, & Konradt, 2005; Kayworth & Leidner, 2000), but high administrative skills, a quick grasp of technical and business issues, inter-personal and communication skills and intercultural abilities were found to be advantageous in this case. The traits of the 'gatekeeper' role, identified by De Meyer (1991) were also recognisable in that the project leader had the capability to take information from many different sources, including internal and external, and make it relevant to the appropriate person or group. The importance of this central role was emphasised by the few occasions when responses from the project leader were not forthcoming and team members reported that the impact on progress of work was impeded resulting in frustration and even anger. Such incidents were considered to be inevitable with such a large project and were exacerbated by the lack of appropriate technologies to access information more centrally.

Culture and diversity issues

The diversity of the virtual team had the potential to impact the project outcomes, not only in terms of cultural differences (Kayworth & Leidner, 2000; Sarkar & Sahay, 2002) but also in terms of technical expertise and personal backgrounds (Hertel et al., 2005). Several factors were held to have contributed to the minimising of such impacts. Culturally, the team consisted of representatives of all EU countries although the main nationalities were

Austrian, Italian and Spanish. The context of the project set within the tourism industry was seen as a contributory factor by stakeholders. Many of the organisations represented were tourist organisations with a history and organisational culture of cross-border cooperation and trade. Recognition of cultural differences was inherent in their day to day work and together with the trans-cultural environment of EU projects that support budget costs for face-to-face meetings, reduced the coordination difficulties and obstacles to effective communication often found in multi-national teams (Kayworth & Leidner, 2000; Maznevski & Chudoba, 2000). Nevertheless, the researchers observed that loose couplings based on nationality tended to occur (De Meyer, 1991), although English was used in any situation where more than one language was represented.

Another contributory factor to the diffusion of cultural differences was the existence of the strong framework of rules that define the working of the project. These rules included stated time schedules, recorded milestones, specific team deliverables and the need for review and consortium meetings. The determination of specific team roles within a structured framework is seen to be one way of overcoming cultural diversity (Hertel et al., 2005) and this is borne out by the experiences of this project. There was no dominant nationality determining the rules with the attendant problems of cultural imperialism and perceptions of imposition of other values (Begley & Boyd, 2003). As one project member stated "EU projects have a shared understanding on minimal cultural rules."

In contrast, the diversity of people's levels of technical ability did raise several issues. One core team member who held responsibilities for business outcomes believed that levels of understanding between the technical and business people were unbalanced. This, she believed, made it particularly difficult for the business people who had fewer technical skills. Amongst the business people there was a shared understanding of the tasks required. For example the marketing literature was successfully produced through good cooperation with people from Austria, Ireland, Italy and England. "They understand the business topic so they understand each other".

Achieving understanding between the technical and the business people was "sometimes very difficult". Team members working on the business plan found it frustrating that input from the technical teams was rarely forthcoming as the technical team were too busy with their own deliverables, and "did not recognise the importance of the business deliverables". This problem was partially solved by adding pertinent questions to the monthly technical survey of pilot study participants and dealt with more efficiently by social contact during face-to-face meetings. Key figures were identified and questioned in the social environment of consortium meeting lunches and dinners enabling relationships to be built that then facilitated email and telephone contact at a later date. Another member of the business team admitted to problems in understanding some of the technical details of the project. She again used social connections to:

"get some deeper information on difficult points during the project – but it sometimes took months because working meetings were so stuffed with topics and the time to pop questions was during breaks or in the evening."

The technical teams' work patterns reflected those of the business teams in that they also held face-to-face meetings outside of the consortium meetings and held a number of "intensive workshops to discuss things". The role of the face-to-face meetings within the project reinforces the literature that holds such meetings to be an important element of strengthening the socio-emotional development of the team (Robey, Khoo, & Powers, 2000) and enhancing learning (Tullar & Kaiser, 2000).

People

We have related the people issues of the conceptual framework to the socio-emotional processes as shown in Figure 1. The interplay of relationships, cohesion and trust are important elements that have a significant impact on the outputs of a virtual team.

Relationships

The complexity of the case study virtual team was a major issue particularly when considering the role of relationships within the project. There were a considerable number of people involved not only in the six work packages, but in supportive guidance roles representing the wide range of stakeholders investing time and expertise in the development of the technical system. This made relationship building difficult although there was little evidence to support the argument that virtual teams have less social focus over time.

At the beginning of the project, the project leader held an initial meeting to introduce members to each other. Although this initiated some social cohesion to the team, it was largely negated by the high fluctuation of people, mainly stakeholder representatives, who 'come and go – some were at a meeting once and were never seen again while some disappeared from contact for 1-2 months' with no replacement nominated. The high turnover of team members led coordinators and moderators of meetings to start every meeting with an introduction of new people to improve personal interaction. Nevertheless, other factors went a long way towards compensating for the difficulty in establishing social cohesion. Key members of the team, including the project leader and project manager, had been involved in writing the initial bid for EU funds and had therefore built up relationships with

early members who played a central role in the coordination of the work package teams. This was also supported by the stakeholder organisations where representatives had long experience in the European travel industry and therefore had personal knowledge of other stakeholders' employees. These relationships underpinned the virtualness of the team between meetings and opened several avenues of support and information beyond the direct line of the project structure. Additionally, fluid team membership can be seen as an advantage in that it brings in new expertise and enables other perspectives to be presented to the team (Cascio, 2000).

However, the development of relationships was largely confined to those attending the meetings and did not extend to the full work package teams. This affected the flow of information which tended to be directed through people that were known to each other. For example, within the business plan work package members had difficulty in drawing information from the other WP teams, which resulted in a lack of relationship-building. Cohesion and trust could not be established and communication via ICT was not enough to overcome this social barrier. This left the one WP member who attended meetings to intercede by making personal requests for information to contacts established in a social environment. Within the work packages, coordinators provided a management line that was more traditional in aspect than commonly reported in virtual teams and the supervision structure of each part of the project simplified what was an otherwise intensely complex project.

Project Cohesion and Trust

The development of team cohesion and the building up of trust was a difficult process. Although a measure of team cohesion remained from the preceding systems project, it was limited to the members of the team involved in both projects. This core provided a shared context that reinforced perceptions of control and contributed to pushing the project forward at difficult points (Lee-Kelley, 2006). Nevertheless, there different levels of commitment to the project outcomes and this affected the way stakeholders rated its importance. For example, there were some partners who placed:

“a high value in being part of the project and some who didn't. There were also persons with a high involvement and some who were just disposed by their company or supervisor or just by accident.”

The result was that project management and work package leaders had to complete tasks with teams that “sometimes consisted of 7 people, but had only 2-3 high involved persons which made it often difficult to work”.

Some team members were contracted to complete specific tasks, such as software development, and although there was commitment to fulfilling their contracts, this did not always translate to a cohesive approach to the end goal. In contrast, industry organisations that foresaw the advantages of the end product worked more cohesively towards a shared outcome. In the case of the former, their reason for project membership was as paid consultants and their aim was to “get the job done”. Face-to-face consortium meetings were sometimes regarded as time wasting exercises; a view that was exacerbated by the extensive agendas that often needed to be covered. In the latter case, there was more cohesion of purpose towards the project and there was significant evidence of trust between the industry stakeholders. Elements of trust such as shared social norms, a common history of experiences and more strongly the ‘anticipation of future association’ (Jarvenpaa & Leidner, 1999 p.792) were more evident in this latter grouping of members. They gained personal and professional value from the project outcomes and from the social interaction between team members. However, the former did display strong levels of trust *within* their work package groups based on the constructs of common professional experiences.

Technology links

At the core of all virtual teams is the ability to communicate via information technologies and to coordinate the work across geographical and sometimes organisational barriers (Kayworth & Leidner, 2000; Sarkar & Sahay, 2002). The fit between the task and the technology is also seen as a consideration that contributes towards success, with the appropriate combination of technologies to accomplish the task (Powell et al., 2004).

Communication and coordination

The project team used a wide variety of communication techniques to keep in touch, exchange information and most importantly, to develop the system technologies. The technical teams accomplished much of their work in a virtual situation, with software tasks being performed over networks. Individual technical teams worked in a traditional environment on internal development work before connecting together virtually. A knowledge base or ‘internal network’ was created by one of the project teams, originally to act as an interaction and communication platform. This knowledge base was the source of major disappointment to several members of the project as it never achieved its potential as a semantically rich information source and provided a limited function more as a data store than as a communication tool. One suggestion to create a forum function was not accepted by the partner responsible for its creation, and maintenance of documents was irregular and unstructured. In consequence, the ability for new and existing team members to draw on project information and to deliberate and analyse it before action, potentially an important benefit of semantically rich information for virtual teams (Majchrzak, Rice, Malhotra et al., 2000; Ramesh & Dennis, 2002) was severely limited.

The majority of the project team primarily used email for communication, backed up by telephone calls when there were “complex questions or urgent decisions needed”. Face to face meetings were arranged between members of WP teams and consortium meetings were planned in a four month cycle. Email was used for short messages and to attach reports but again attention to maintenance was limited. This meant that the mailing list was not balanced and emails went to larger distribution lists than was necessary resulting in information overload. The sheer number of emails meant that “some people only read unimportant stuff and important stuff was lost or not seen”. To add to the confusion, some elements of more vigorous discussions (quarrels) had smaller distributions, but were then copied, answered or forward to increasingly larger numbers of people. These became impossible to understand with the result that “some people stopped their reactions to email or just ignored them”. Despite the wide range of nationalities involved in the project, misunderstanding of email texts was very rare. Telephone calls were apparently seldom used for such discussions, and were largely restricted to WP teams.

Lack of personal knowledge of some of the social interactions also led to problems in understanding of emails, particularly for the business team who were reliant on all other WP teams to draw information together for the final business report. For example, their email requests for information were either ignored or resulted in contradictory information from many different sources. “We were not always clear as to whom to believe. We thought ‘is this person the knowledgeable one or is their input purely off the top of their head?’” Many of the contradictions and way forward for this team were smoothed by a key face-to-face meeting with the project management that “gave shape to our work and where it fitted with other members of the team”. Such face to face meetings were of significant value to many of the WP teams and support the findings of Maznevski and Chudoba (2000) who found that periodic physical meetings can provide good results in coordinating activities and driving a project forward. This was particularly important in the case study because the coordination of the WP groups was done through the project management team and there was not a great deal of cross collaboration between all the members of the project. Levels of interaction between the WP teams tended to develop through the representatives who attended the meetings.

Coordination of the project was also enhanced by the formal reporting structures that are an integral part of EU projects. Internally, reporting structures were more informal and certainly within the WP groups there were differences. For example, in the pilot study group reporting remained formal between the pilots and the technical team with monthly reports collated and distributed across all teams. In contrast, the business plan team met weekly and retained their own informal notes of each meetings internally. The differences were influenced by physical proximity and the nature of the tasks faced. The former group were developing the technology in a dispersed environment and therefore formal reporting aided the progress of system development. The latter group were physically co-located and their outcomes did not influence others, but rather was dependent on information from other groups. Although information exchange was possible through the knowledge base, the unstructured nature of the data severely reduced its effectiveness and prevented the advantages of semantically rich media being gained (Ramesh & Dennis, 2002). Although Powell et al., (2004) argue that virtual teams have the ability to diverge from formal structures and traditional reporting requirements, the confines of an EU project hindered any real development of new forms of reporting. It should be added that team members expressed more comfort with the formal structures laid down by the project rules and did not perceive any gains from altering the system.

Task-technology fit

The technology potentially available to the project team was not widely utilised. Although groupware had been used in a previous project it was not seen to be successful in engaging team members and was not implemented. In the same way, a proposed forum was deemed to be too difficult to use and reliance was placed on email and the knowledge base. As there was a lack of accountability with the knowledge base and it was difficult to use, the team rarely referred to it and despite the project leader’s efforts to cajole people into updating their inputs, she had little success. The consortium meetings were used to manage areas of conflict, report on current status and agree the next stages of work. Email was used for follow ups, routine reports and analysis and gathering data. This broadly fits with findings from the literature (Majchrzak, Rice, King, Malhotra, & Ba, 2000) although we did not find evidence that the team adapted their communication to fit the team structure (Maznevski & Chudoba, 2000) or worked to maximise the benefits of ICT. This we believe to be the result of the composition of the team where membership was through the various organisations and individual’s commitment was lessened by the fluidity and complexity of the team structure.

Outputs

The final outcomes of the project were deemed successful within the terms of the EU funding requirements and the deliverables from each work package team. Outputs were only considered in these terms and there was no attempt to evaluate project success in terms of members’ attitudes or behavioural outcomes (Cohen & Bailey, 1997). The final aim of the project was the market validation of the prototype system and furthering the development of the ontology data management system for real world use. The funding body accepted the final

deliverables as meeting the contract specifications. Further validation was the creation of a non-profit organisation to continue development of the existing system with membership offered to project team members and other industry bodies. This work is ongoing.

CONCLUSIONS AND RECOMMENDATIONS

In examining the issues that affected the work of this project we have discussed many factors that either contributed to or hindered the efforts of the team to achieve successful outcomes. That these outcomes were considered only within the terms of meeting the funder's requirements and the ongoing nature of the project's software system does not detract from the accomplishments of the team. Nevertheless, we acknowledge that the issues of loyalty and satisfaction of team members would be a contributory factor should further work between the individuals be considered. It was the nature of this project that the organisational bodies involved clarified success in the way we have used it.

In relating the issues arising in this research to existing theory we have identified positive elements that contributed to the end result. We have also seen where the potential offerings of the virtual environment were not realised and how this resulted in difficulties that were not foreseen or understood during the project period.

The structure of this project was identified as transitional, with a strong tendency to revert to traditional type where possible. The advantages of integrated or decoupled teams were not realised mainly due to the lack of semantically rich media. The opportunities to have an extensive and maintained knowledge base were not taken and as a consequence much of the richness of the accumulated data proved inaccessible. We would recommend that any virtual team sets the structure for its data repository at the beginning of a project and identifies a data manager with responsibility for its upkeep.

A significant contribution to the positive outcome was the key role of the caretaker/gatekeeper in the form of the project manager. The project manager was able to draw together the differing technical and business elements, to coordinate the work package teams and to keep the focus on the milestones and deliverables. We believe that the combination role of caretaker and gatekeeper is essential to a dispersed team. In addition to administration and communications skills the role requires inter-personal and trans-cultural abilities as well as a grasp of the technical and non-technical elements of each individual project.

Culture and diversity are seen as major issues in virtual global teams. Culture proved to be a minor issue in this case, although we recognise that the nature of an EU project and the context of the tourism industry contributed to the minimisation of issues. In contrast diversity was the source of some tensions that should have been resolved at an early stage. Diversity in the motivations for membership of the team led to different attitudes that affected cohesion and trust and made it difficult for the project management team and other WP teams to interact. Diversity in technical skills was a recurring source of tension with technical and business teams not fully appreciating the roles of each other. Despite tight timescales and demands of work this could have been dealt with by earlier training and workshops to support mutual trust and understanding. A more explanatory and accessible data repository, together with the disputed forum facility, may have also helped to overcome these issues.

Finally, our research strongly supports De Meyer's contention that face to face contact is the 'backbone of an efficiently operating information network' (1991 p.49) and the importance of social interaction should not be underestimated in dispersed teams. Although we concede that it is possible for totally virtual teams to interact and build social relationships and trust, we conclude that success in this area would require a well-structured and detailed plan written by managers with a full understanding of the issues involved. These include consideration of the context of the virtual team, a structured training and socialising period, a good range and detailed knowledge of ICT, appreciation of semantically rich media and a skilled caretaker/goalkeeper to lead the team.

LIMITATIONS AND FURTHER RESEARCH

This research addresses a dispersed team in the travel and tourism industry where cultural diversity is understood. Therefore the issues discussed may not be applicable in a less culturally skilled context. In the same way diversity of technical and business elements are not always present in one project.

The context of the dispersed team as an EU funded project may have implications that do not apply to other situations. Conventions and protocols built up over years of project work exist in this environment and may influence the findings, although we have found no evidence of this.

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