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Communications Management in Remote Construction and Mining Projects

A Master's Thesis submitted for the degree of
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Affidavit

I, **Justin James Willis**, hereby declare

1. that I am the sole author of the present Master Thesis, "Communications Management in Remote Construction and Mining Projects", 75 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and

2. that I have not prior to this date submitted this Master Thesis as an examination paper in any form in Austria or abroad.

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Abstract

This thesis investigates the management of communications in remote construction and mining projects. Due to the remote nature of the projects, the team structure will not be a traditional structure. Instead the team will most likely be divided into collocated subgroups and communicate through ICT, as a Partially Distributed Team (PDT).

Issues faced by this type of team structure are investigated, along with literature on virtual teams, global virtual teams and distributed teams. Particular focus is paid to the challenges of operating these types of teams, trust within these types of teams, and the challenge posed by in-group dynamics.

Communications management processes and tools are investigated. The communications management plan is a main part of the communications management process. A selection of the communications tools available for use is reviewed, with a focus on those that can be adapted for use in a PDT. Tools for project planning, project execution and project reporting are considered.

A brief examination of the use and issues associated with remote construction and mining projects is presented.

The above elements are combined and discussed, separated into the three stages of project planning, executing and reporting. Conclusions are reached regarding the need for an intra-team section in the communications management plan, the requirement for and use of face to face contact, and the adaption and use of communications tools. Guidelines are discussed for the prevention of negative effects of in-group dynamics. Some issues are unresolved, for example media choice and leadership and communication structure.

A summary is presented, and limitations discussed. One key limitation is the use of student teams in most of the research to date, and the lack of studies on functioning commercial teams. This is a possible area for further research, the study of the principles and guidelines discussed in commercial distributed teams.

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1   INTRODUCTION

"Communication has been identified as one of the single biggest reasons for project success or failure" PMI 2008 p.419.

"A project that communicates poorly is going to perform poorly" Dow and Taylor 2008 p.xxi.

Across the project management industry, effective project communication is considered a key enabler of project success.   Even for a 'traditional' project format, i.e. all resources located near to each other, for example one company with only one office undertaking a new product, or a construction project in a large city with many resources nearby, the communication can be very difficult to manage.   How is the project team going to manage the communications when additional barriers are placed within the team itself?   Looking at the two examples above again, when the company has both a Europe office and a North American office and the product team is sourced from both offices?   Or when the design for the construction project is undertaken in another city hundreds of kilometres away?

Virtual teams, global virtual teams and distributed teams are all common terms within today's business environment.   All generally refer to project teams where the use of Information and Communications Technology (ICT) constitutes all or a significant portion of the interaction between the team members of a team, who are dispersed over various locations.   The advantages of such teams include flexibility, drawing on knowledge, skills and perspectives that would not be available at one site and enabling organisations to pool talents (Zhan and Xiong, 2008).   Examples of such teams and the majority of research to date come from the software engineering field.

In some situations, not all the project team members are distributed or dispersed, and collocated subgroups can be found within the project team.   Examples include when employees from different offices within a company form a team, an external company or consultant is added to form a team, or when the project site is located

remote to the design office. This team structure will then use a mix of ICT and face to face contact, and is referred to as a Partially Distributed Team (PDT).

PMI (2008) describe nine key knowledge areas of project management. Of these, Project Communications Management is the area considered to be most affected by a PDT structure, as the communication must now overcome geographical and possibly temporal distance.

1.1 Motivation

The motivation for this thesis is based on personal experience working on a remote construction project at a goldmine in Mauritania. For this project the team was split into a sole site presence with the remainder of the team including the project manager based in the company offices in the UK. Examples of this team structure are becoming more common in industry, and factors that affect the project success need to be examined. A strong focus on communications management is one of the factors of successful management of construction projects in remote locations.

1.2 Research question

This thesis investigates how communication can be managed within a project when the project team structure is a PDT i.e. split into two or more collocated subgroups. This thesis investigates the 'typical' problems a PDT can experience, and seeks methods of avoiding or mitigating the effects of, these problems.

1.3 Thesis Overview

This thesis examines the management of communications within a PDT through a review of literature on: PDTs, distributed teams and virtual teams; project communications management; project communication tools; and remote construction and mining projects. As a result of this literature review some recommendations for communications management within PDTs are made.

Chapter 2 provides the definitions used, a description of the problem and the research approach taken.

Chapter 3 is a review of the available literature on the issues faced by PDTs, distributed teams, and virtual teams. A large section of this literature comes from the software management and disaster relief areas. Key issues covered include the effectiveness of PDTs and distributed teams, challenges facing PDTs and distributed teams, and in-group dynamics.

Chapter 4 is a review of the literature with respect to project communications management. This section looks at the process involved and some of the stages and effects of project communication management.

Chapter 5 examines a selection of communication management tools through 3 stages of the project process, the planning executing and reporting stages.

Chapter 6 briefly examines construction and mining projects.

Chapter 7 is a discussion of the issues, combining the elements of PDTs, communications management and communication tools, with respect to construction and mining situations. This section focuses on two issues in particular, the Communication Management Plan, and managing in-group dynamics.

Chapter 8 contains a summary of the main points of the discussion, concluding remarks on communications management in remote mining and construction projects and, limitations of the study and opportunities for further study.

Chapter 9 lists the references used.

2 PROBLEM DESCRIPTION

2.1 Working Definition

For the purposes of this thesis, the following definitions will apply:

2.1.1 *Distributed and Partially Distributed Teams*

There is a significant body of research into the management and use of so called 'virtual teams', predominantly from the field of software engineering. Most of these studies define a virtual team as a team assembled from various locations for a short or long term project (with a fixed end point) where the only or predominant means of interaction for the team is based on ICT (Information and Communications Technology), i.e. email, teleconferences, video conferences, instant messaging, shared website space etc.

These teams are also referred to as geographically distributed teams. Bradner et al (2005) preferred this term, as it refers to the geographically dispersed nature of the teams, while virtual refers only to the means of communicating.

A sub set of the research into virtual teams is devoted to Partially Distributed Teams (PDTs). These are defined as having two or more collocated subgroups, with the subgroups being geographically dispersed (Ocker et al, 2010). Within the situation examined in this thesis, PDTs are a closer fit, as the site and particularly the design team are anticipated to contain more than one member. Thus they would be operating as collocated subgroups of a single team.

2.1.2 *Project communications management*

Project communications management is generally defined as the managing of communications between the various parts of the project team, as well as between any other stakeholder, including client(s), government agencies, contractors and subcontractors, and any other interested parties

In the context of this thesis where the focus is communication of team members, project communications management will refer only to communication between individuals within the project team. This includes communication within subgroups, and between the subgroups.

2.1.3 *Remote construction and mining projects*

A remote project is defined for the purposes of this thesis as any project where the project site is located more than a days travel using conventional transport away from the main project office. In this thesis the focus is limited to projects that are related to the construction or mining industry.

2.2 Problem description

Exploration for mineral deposits is occurring in ever more remote locations. If the decision is made to exploit these deposits the construction of mine infrastructure will be required. However the era where all resources required for a project were transported to the project site is over. Instead, the project team will often be divided, with a smaller site representation. Often this division will comprise a design section based in the main office, and site based engineers and supervisors responsible for implementing the design.

The success of any project is dependent upon many factors. However in the case of a remote construction project using a PDT structure, the geographical and temporal distance will add many challenges not faced by a traditional project. Considering the nine key knowledge areas defined by PMI (2008), the communications management is deemed the area most affected. Communications management is generally considered one of the most crucial areas to a projects' success, and the distance and structure could significantly affect effective communication, threatening project success.

This thesis researches the issues surrounding effective communications management of a PDT working on a remote construction project. The issues considered are primarily those that affect project success.

2.3   Research Approach

This thesis is based on a review of the relevant literature available, and focused on four main areas.

- Virtual teams, distributed teams, and PDTs, examining the theory associated with these team formats, challenges and potential problems

- Communications management planning, examining the aspects and effects of the communications management plan

- Communication tools, and how they are used with respect to effective communication management

- Mining/construction projects, and the current trends and issues in remote projects

Following this review, a discussion of some relevant issues is presented.

3   DISTRIBUTED AND PARTIALLY DISTRIBUTED TEAMS

Studies into the use, management and various characteristics of distributed and partially distributed teams are relatively modern, with most of the research occurring within the last 15 years.   Despite this, there is a significant body of knowledge and research into the subject.   Within this literature, only a subset is directly related to PDTs.   However as the many of the problems are similar, available literature on both distributed teams and PDTs are reviewed within this section.

3.1   Effectiveness

There is much debate over the effectiveness of virtual teams. Strauss and McGrath (1994, Cited in Guo et al, 2009, p.2) state that computer mediated communication restricts the transmission of important non-verbal and paraverbal cues, which enable team members to regulate interaction, express information, monitor feedback and create common ground and a sense of understanding.   Thus for project aspects that require collaborative problem solving and decision making, the communication efficiency will be decreased as will team outcomes (Daft et al, 1987 and Short et al, 1976, Cited in Guo et al, 2009, p.2).

Burke and Chidambaram (1996) studied computer mediated communication comparing synchronous and asynchronous meetings with face to face meetings, and found no significant performance differences.   In fact the mediated meeting participants performed slightly better than their face to face counterparts.   Burke and Chidambaram hypothesised this was due to the face to face communication hindering task focus.   They did note however, this study was based on temporary groups and time restricted and for longer term teams the results may be different.

On the other hand, in the study by Guo et al (2009) where a dialogue technique was tested, the collocated teams always outperformed the virtual teams, when other controlled variables were the same.

Baskerville and Nandhakumar (2007) note the performance of virtual teams

compared to collocated teams appears to be situational. Martins et al, (2004, Cited in Baskerville and Nandhakumar, 2007) showed that virtual teams can perform better than collocated teams when a diversity of concepts and perspectives is required, or when the task is able to be completed adequately using electronic documents and tools.

Based on a three year study of virtual teams working for Intel, Pickering et al (2006) reported no negative effects on perceived performance through the use of virtual teams. One positive effect noted was an increase in collaboration across organisational units.

Kiesler and Cummings (2002) studied the issue of virtual teams by examining past research on proximity. They hypothesise that distributed work is prone to coordination and cohesiveness losses. If there is a lack of social identity or group identity, distributed teams are less likely to try to solve a difference in opinion and expectations.

3.2   Challenges

There are numerous challenges facing a distributed or partially distributed team that a traditional collocated team may not have to deal with.

3.2.1   *Discontinuities*

Distributed or virtual teams can be thought of as teams that have to span or cross discontinuities between team members (Waston-Manheim et al, 2002). Developing this concept, Chubdoba et al (2005) proposed six discontinuities that can affect distributed teams:

- Geographical

- Temporal

- Cultural

- Work practices

- Organisation

- Technology

Based on a study of Intel corporation, Chubdoba et al (2005) determined three 'overarching' discontinuities that can be used to describe and measure virtuality. These are team distribution, workplace mobility and variety of work practices.

Pickering et al (2006) discuss a further discontinuity between team members of a distributed team - working across multiple projects i.e. the number of projects being worked on at the same time by each team member.

3.2.2   *Mutual knowledge*

Effective communication is based on what is known as 'mutual knowledge', shared information that is known to be shared (Cramton, 2002). For example, when two team members have been working on the same report, they can refer to it simply as 'the report' as opposed to its full title. Both members know to which report reference is being made. This is also referred to as 'common ground'. However in distributed teams, mutual knowledge is difficult to establish. Cramton defined five vulnerabilities in communication of distributed teams which hinder the creation of mutual knowledge:

1. Failure to communicate and remember contextual information

2. Uneven distribution of information

3. Differences in what is considered salient, or failing to appreciate the salient points

4. Differences in speed and timing of activities and technology

5. Uncertainty about the meaning of silence

Cramton (2002) describes the communication between team members of a distributed team as '... a leaky and incomplete process.' p.364.   However the

perception is that the communication process is robust and any failures are the fault of the team members. The end result of all these vulnerabilities is a negative effect on the working relationship. For example, when no answer is received from an email, this could be to a technological delay or fault (Vulnerability No.3) or because the recipient is on holiday (Vulnerability No.1) however is taken as consent to the proposal (Vulnerability No.5). In any case, feelings of frustration and antagonism can result, and even when communication is re-established and the issue resolved, these feelings can persist (Cramton, 2002).

Cramton (2002) suggests guidelines for combating these vulnerabilities. These include sharing contextual information, sharing information to all team members, and investigating unusual messages or out of context messages before jumping to conclusions. Cramton notes that it is common advice for teams to meet face to face, however she suggests holding this meeting(s) in each other's locations, so that situational information can be absorbed. If this is not possible, Cramton suggests sending key members of each subgroup to the other locations as an alternative.

3.2.3 *Proximity*

People who are proximate have more impact over an individual (Kiesler and Cummings, 2002). Proximity is associated with numerous beneficial behavioural changes:

- An individual is less likely to 'free ride' or fail to perform an equivalent share of the work when proximate to other team members.

- Proximity dramatically increases the probability of voluntary work collaboration.

- When performing well known or easy tasks, the presence of others increases alertness, motivation and speed.

- The likelihood of cooperation and learning to cooperate is increased when proximate.

- People in face to face meetings command one and others attention and feel more

involved.

- As a result of this attention, the meeting is more memorable, compared to when they are not proximate.

Comparably, an increase in distance can be associated with several negative effects:

- A lower level of attention to colleagues

- More possibility of 'free riding', failing to perform an equal share of the work

- Delays as work from proximate colleagues takes precedence

- Lower effort expended by the team member

- More difficult for groups to make decisions or work together

Similar to other studies, Kiesler and Cummings (2002) note this is task dependant to a degree, with tasks requiring high team member interaction suffering due to increased distance, while tasks which require little team member interaction are perhaps performed better with increased distance.

It is also to be noted, that performing difficult or new tasks in the presence of others can cause stress, distraction and reduce accuracy.

3.2.4   *Face to face contact*

Distance between team members makes face to face contact difficult or near impossible. Even a very short period of face to face contact has been proven to have a large impact on people's behaviour and choices, mostly with respect to cooperation (Kiesler and Cummings, 2002). This is considered to be a result of an increase in group identity and commitment.

When a group lacks the chance to discuss face to face, it also lacks the easiest way to coordinate and cooperate (Kiesler and Cummings, 2002). Face to face discussions can overcome conflict, improve and maintain group commitment, enhance cooperation, and is the best means of coordinating work.

3.2.5 *Spontaneous communication*

One of the greatest effects of distance on teams is the restriction it places on spontaneous communication opportunities (Kiesler and Cummings, 2002). Spontaneous communication is considered to allow team members to:

- Learn informally the progress of tasks

- Anticipate strengths and failings in others work

- Monitor group progress

- Coordinate tasks

- Provide favours or assistance to each other

- Provide 'last minute' help when things go wrong

Spontaneous communication also has a strong effect on communication pleasure and relationships, allowing for the establishing of strong ties (Kiesler and Cummings, 2002). While there is evidence that spontaneous communication can be facilitated by ICT and over time strong ties can develop, it is considered that proximity and face to face contact achieve this better. ICT can, however, facilitate the maintenance of strong ties.

3.2.6 *Time*

In their study of student PDTs, Plotnick et al (2010) discovered the greater the time difference between the collocated subgroups, the lower the communication level between the subgroups. In the study, time difference is considered to be analogous to geographical and cultural differences as well. They hypothesise that this is because the time difference could be too large for synchronous media, while making asynchronous media difficult and frustrating.

This is supported by Espinosa and Pickering (2006). Time differences have been shown to have an effect on coordination effort required, and the greater the time

difference the greater the increase in effort required. Also a contributing factor is the number of locations spanning time differences i.e. two locations spanning one time difference as opposed to multiple locations with varying time differences between all. In the later, the coordination effort increases again.

3.2.7 *Team member migration*

Baskerville and Nandhakumar (2007) noted an interesting example in their study on virtual teams, whereby over time through meetings at the one location, a virtual team gradually became a collocated one, as the means of communication switched from virtual to face to face contact. They noted reasons for this as a diminishing of personal trust between team members and a fear from team members that they would be 'left out' if the team broke down. Thus team members gradually migrated to a central location where one of the senior team members was based.

3.3 Trust

There are numerous different definitions of trust, and classifications of the dimensions or elements of trust (Zhan and Xiong, 2008). Almost all of the studies of trust include the condition that one party must put themselves willingly in a position of vulnerability or risk to another party (Gallivan, 2001; cited in Zhan and Xiong, 2008).

With respect to distributed teams, several classifications of trust appear to be commonly adopted.

3.3.1 *Swift trust*

For temporary or short term situations of people working together, Myerson, Weick and Kramer (1996) describe a form of trust called swift trust. This form of trust is unique to temporary systems where the time is not available for the more usual forms of trust to develop. Swift trust is based on the belief that team members care about the activity, can suspend doubts, are willing to take risks, and an expectation of benefits from the activity.

Iacono and Wesiband (1997) expand on Myersons et als work, by describing swift

trust as dependant on interactions composed of initiations and responses. Teams that continuously interacted over the duration of the project maintained higher levels of swift trust and performed better. Baskerville and Nandhakumar (2007) cite reports that teams who form swift trust early are more likely to retain trust throughout the duration of the project.

Zhan and Xiong (2008) summarise the available literature concerning trust in distributed teams by noting the ability of temporary or short term teams to use swift trust, but that longer term teams *require* face to face contact and that face to face contact should be undertaken at the formation stage of the team if possible.

3.3.2 *Personal and abstract trust*

Baskerville and Nandhakumar (2007) define two types of trust operating within a virtual team: Personal trust and Abstract trust. Personal trust is based on a relationship with the people in the team, and is formed and reinforced through face to face contact. Abstract trust is based on the structures of an organisation, for example hierarchical authority.

Baskerville and Nandhakumar (2007) state personal trust and abstract trust are interrelated, and each one develops into the other. Personal trust formed between people within the organisation that follow the company structure, e.g. team member to project manager, develops abstract trust for all the structures of the organisation. For first time or one time interactions within the organisation, abstract trust is relied upon. Over time this enables the forming of personal trust. Baskerville and Nandhakumar (2007) used the following diagram to represent this.
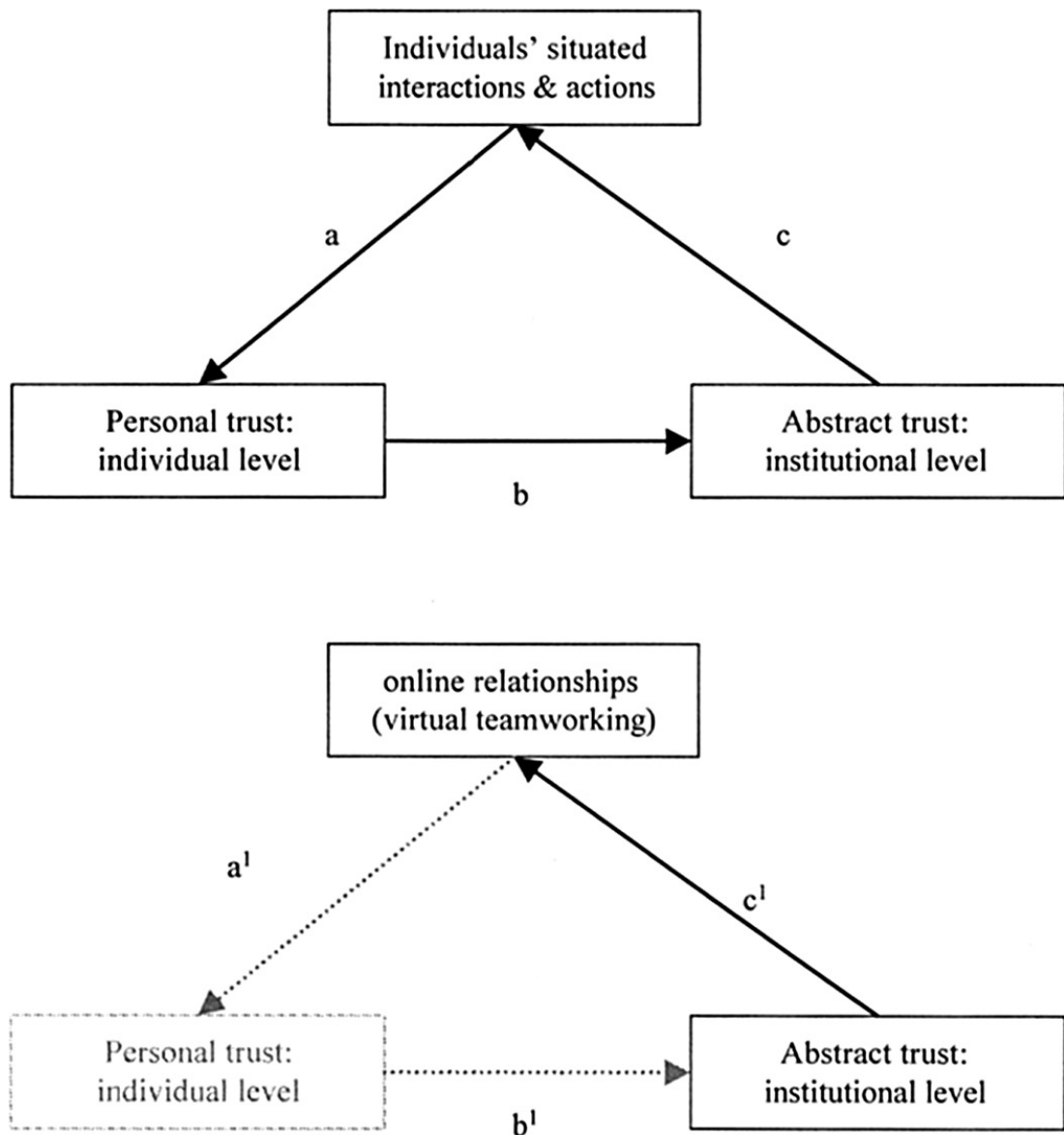
Figure 1. Relationship between personal trust and abstract trust from Baskerville and Nandhakumar (2007 p.24)

Within virtual teams, abstract trust is relied upon to facilitate the working relationship, but as the face to face contact is not there, personal trust is not developed. Baskerville and Nandhakumar (2007) believe that personal trust will diminish over time and note that abstract trust alone appears unable to sustain virtual team working over long periods (defined as greater than 1 year). This is shown in the lower diagram of figure 1.

Baskerville and Nandhakumar (2007) cite evidence that in long term teams regular

face to face meetings are still a feature, allowing for the re-establishing of the personal trust.   They report that most people feel ICT is unable to support personal trust.

3.4   Communication

3.4.1   *Structure*

Ocker et al (2010) describe three main structures of communication occurring within PDTs.   These are:

- Hub and spoke, where each subgroup leader is the hub for communication between subgroups

- Moderate network, where fewer than a majority of members interacted between subgroups

- High network, where a majority of the members interact between subgroups

Based on a study of students, Ocker et al (2010) note that the hub and spoke structure teams experienced the most problems communicating between subgroups.   The subgroup leaders acted as "gate-keepers", with all information funnelled through them.   In contrast the high network teams experienced communication process inclusiveness.

Panteli and Davison (2005) describe a similar structure within their study on subgroups in distributed teams.   Three levels of subgroup impact were identified based on an analysis of the communication within each team: high impact; medium impact; and low impact.   High impact subgroups characteristically used words such as 'we' and 'you', and achieved a subgroup consensus before engaging with the other subgroup.   This correlates with the hub and spoke structure Ocker et al (2010) describe, although note is made that in Panteli and Davison's study the teams did not necessarily appoint sub group leaders.   At the other end, the low impact teams were more inclusive with communication, and comments were directed to the team as a whole rather than through a subgroup consensus, corresponding to the high network of Ocker et al (2010).

Suchan and Hayzak (2001) noted in a case study on a large corporation employing virtual teams the attitude of the team members to communication was very focused on the task. "Communication was seen as a strategic activity that had to be consciously thought about at the start of each workday" Suchan and Hayzak (2001, pg 182). Team members would review the tasks for the day and determine which media would be best suited for each task. Thus communication was seen as part of the team members' work, not something that followed the task. So as the task progressed, the choice of how best to communicate the work achieved on this task were also considered.

3.4.2 *Dialogue Framework*

Huang et al (1998) describe a dialogue framework for use in the creation of a shared team understanding. This framework is based on dialogue theory found in organisational science, and involves the creation of a common team model for communication practices within the team. Studies where the framework was applied at the initial stage of virtual team development reported better relational development, better decision making, group satisfaction and team performance compared to teams without the framework (Tan et al, 2000; Huang and Lai, 2001; Guo et al, 2010).

Within Guo et al's study, it should be noted the causality of the improved team characteristics was not exhaustively proved. In their study all teams had spent the same amount of time together, although in the groups using the non dialogue technique, they were only instructed to talk about general topics, with no attempt at directing the conversation onto formulating communication norms. The question of whether the teams would have performed the same, had they discussed and attempted to resolve a common basis for communication without using the dialogue technique remains unanswered.

3.5 Technology Choice

The relationship between choice of media and media characteristics/perceptions is unclear and subject to disagreement by experts (Burke and Chidambaram, 1996).

Several prominent theories are discussed in this section, along with factors that influence media choice within PDTs.

3.5.1 *Social presence theory*

Social presence theory examines the extent to which a person's presence is felt whilst communicating (Short et al, 1976; cited in Burke and Chidambaram, 1996). Some types of media are better at transferring social presence, and as a result are better for communication where the persons presence is important e.g. social or relationship communication. Conversely media with low social presence transference is better where the presence is not important, e.g. task focused communication.

Face to face communication is described as the form of communication with the highest level of social presence (Short et al, 1976; cited in Burke and Chidambaram, 1996). Thus for team situations when this presence is important, e.g. conflict resolution, or team development, performance will suffer when the media transfers a lower level of social presence i.e. computer mediated communication. Additionally, team cohesion can be expected to be reduced, and performance on complex tasks can be expected to be lower (Burke and Chidambaram, 1996).

3.5.2 *Media richness theory*

Daft and Lengel (1986) define two types of 'forces' driving information processing, uncertainty, and eqivocality. Uncertainty can be considered as a lack of information, while equivocality can be considered as ambiguous information. Uncertainty can be solved simply through a request for more information, while equivocality requires interpretation, or put another way, it is not clear what further information to request.

Media richness is defined as the information carrying capability of the data (Daft and Lengel, 1986). Different media have the ability to carry different amounts of information. Very rich media has the ability to reduce equivocality, as it carries extra information that can aid interpretation. Lean media carries little or no extra information. The richest media is face to face contact, while examples of lean media are written forms of communication (letters etc).

Daft and Lengel, (1986) proposed the degree of communication effectiveness is dependent on the match between richness of the media used and the information requirement of the users. Thus information exchange that requires a high degree of richness, but uses a lean media is less effective. Similarly, they propose that the choice of media will be related to the task, users will chose the media that is best suited to the task. However this argument has been challenged by many authors and further theories developed (see media synchronicity theory and channel expansion theory below). Timmerman (2002, cited in Saetre et al, 2003), considers the use of media choice theories to be applicable only when the mindfulness or mindlessness of the user is taken into account.

In distributed teams, therefore the media richness and choice of media can affect communication effectiveness. As media choices may be limited, and leaner media may be all that is available, communication effectiveness could be reduced. This will be particularly apparent in tasks involving collaborative problem solving and decision making.

3.5.3 *Media synchronicity theory*

Media Synchronicity Theory is an extension of media richness theory and seeks to update the theory to account for changes in ICT, social factors and communication processes (Dennis et al, 1998). Synchronicity refers to the ability of the media to encourage and support concurrent activity by team members, and focuses on the match between the media capabilities and the communication processes, which have been split broadly into conveyance and convergence. The conveyance process focuses on the transport of information, while convergence is creating a common understanding.

By this theory, for simple information transfer within a team, media supporting lower levels of synchronicity should achieve better performance, while for reaching agreement within a team media supporting higher levels of synchronicity should achieve better performance (Dennis et al, 1998).

3.5.4 *Channel expansion theory*

Similar to media synchronicity theory, channel expansion theory extends media richness theory, reflecting social influences to media choice. Channel expansion theory links the richness of media to the team members experience and perception of the media (Carlson and Zmud, 1999; cited by Klyueva, Undated). A users experience and familiarity with the media, with the person whom with they are communicating, and the topic that they are communicating on, will affect how 'rich' the media is perceived. Team members, who have a great deal of experience with all three, will be able to interpret small clues in the media, expanding a lean media into a richer media.

Consequently, as team members' familiarity with the media, the topics and the other members increases over time, so does the richness of the media (Carlson and Zmud, 1999; cited by Klyueva, Undated). This can develop to the extent that effective communication can be achieved through an unlikely choice of media. Conversely when deciding upon which media to use, consideration on the team members experience with the media, with each other and with the topic should be made.

3.5.5 *Team size*

Bradner et al. (2005) studied technology versus team size, and concluded that for smaller teams, where coordination is easier, the technology is more focused on collaboration, while for larger teams where coordination is more difficult, technologies which facilitated coordination where more prevalent. This challenges many of the previous held theories on technology use.

3.5.6 *Media use in PDTs*

In their study of student PDTs, Plotnick et al (2010) suggest that the choice of media for communication between collocated subgroups could vary compared to that used for within each subgroup. When presented with a variety of communication media, the favoured communication media between subgroups may vary, e.g. one subgroup favouring email, while the other subgroup preferring telephone. This may be a

source of conflict that needs resolving by the team leader(s).

Plotnick et al (2010) studied the link between media choice, leadership, temporal distance and trust within PDTs. They recommended that PDTs have access to a variety of asynchronous and synchronous media from which to choose. They also recommended that attention must be made to the way that media choices can affect trust. Trust is based on communication, and media choice can affect the effectiveness of that communication.

3.6   Team Size

Bradner et al. (2005) studied team size within distributed teams for a large multinational corporation. Smaller teams (defined as less than 9 members in the study) were shown to have better member participation, rapport, awareness of team goals, knowledge of other team members personalities and work roles and were more willing to communicate. This was compared to larger teams of greater than 14 members in size. This study confirmed hypotheses based on previous studies showing larger team members participate less (Hare 1952, Gibb 1951, Cited in Bradner et al. 2005 p.69), have less motivation to perform (Steiner 1972, Cited in Bradner et al. 2005 p.69) and lower satisfaction (Katz 1949, Slater 1958, Cleland 1955, Cited in Bradner et al. 2005 p.69).

Cramton and Hinds (2005) remark that the larger the number of people within each location (collocated subgroup) the more inter-subgroup communication is likely to result. This can affect the in-group dynamics, as ethnocentrism is related to exclusive communication.

3.7   Subgroup dynamics

3.7.1   *Faultlines*

Faultlines are the configuration of characteristics over which team members can perceive subgroups to exist, and reflect the potential of a team to break into subgroups (Cramton and Hinds, 2005). Examples include along professional divides (engineers vs designers) or by gender (men vs women), or location.

Faultlines require activation through an event, after which awareness of the subgroup results (Cramton and Hinds, 2005). When location is combined with other attributes eg all designers in one location, all engineers in another, then this subgroup awareness is intensified.

Plotnick et al note that faultlines between subgroups should be expected within a PDT. They note the collocated subgroups are likely to share resources, and organisational and work culture. In addition Hinds and Mortensen (2005, cited in Plotnick et al 2008 p.2) found the shared face to face contact of the collocated subgroups are likely to create a shared identity, while Huang and Ocker (2006, cited in Plotnick et al 2008 p.2) believe the geographical, temporal and cultural distance strengthen faultlines.

Polzer et al (2003) describe two lines of thought present in much of the research regarding diversity in teams; that diversity can lead to great insight or great misery. They studied the distance dimension of diversity, and concluded that geographical distance could create a faultline when other demographic dimensions were controlled. They conclude this is due to the ease of communication within each collocated subgroups, which results in uneven information distribution. They note that when other demographic factors are also included then the faultlines can become stronger.

Cramton and Hinds (2005) note that subgroup dynamics are likely to be more exaggerated when the team has a low number of locations; and the subgroups are of roughly equal size. This is supported by Polzer et al (2003) who found that faultlines were most apparent when the team was divided into two equally sized subgroups. As a result, a team with more diversity, i.e. where it is possible to split into more than two subgroups, could have a lower propensity to form strong faultlines.

When workers experience a shared social setting, they tend to create feelings of ownership over spaces, creating boundaries and marking territories (Kiesler and Cummings, 2002). Marking territories can exclude others, increase feelings of ownership about the people in the territory, contribute to group identity and increase satisfaction in the groups work. As a result, this tendency to create territories

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hinders team members identifying with the overall team.

3.7.2 *Effects of subgroups*

It is noted by Huang that Ocker (2006, cited in Plotnick et al. 2008 p.1) that PDTs are particularly susceptible to in-group dynamics.   In-group dynamics are the forming of an 'us' and 'them' mentality, with the 'us' becoming the in-group, and the 'them' becoming the out-group (Cramton and Hinds, 2005; Plotnick et al, 2008).   This gives rise to positive and emotional attachment to the in-group and a negative even hostile reaction to the out-group (Cramton and Hinds, 2005).   As a result of this the relationship between subgroups can become competitive and marred in conflict, for example the withholding of information or co-operation (Cramton and Hinds, 2005).

In their study on PDTs, Plotnick et al (2008) note the relationship between subgroups was frequently strained.   The biggest issue was a lack of awareness of what the other subgroup was doing.   Also highlighted were not giving full consideration to out-group(s) work contributions and that the leaders of each subgroup were motivated by distrust when assigning tasks i.e. giving lower importance tasks to the out-group and keeping the more important tasks within the in-group.

However Panteli and Davison (2005) noted in their study of subgroup dynamics within virtual teams "For the task type that we studied (a cooperative one involving brainstorming and group authoring), all teams (irrespective of subgroup impact) performed more or less equally well." p198.   Although they did note team cohesion can be affected by subgroup dynamics, and that for tasks that require a high degree of coordination subgroup based working may hinder team effectiveness.

3.7.3 *Combating in-group dynamics*

After the activation of faultlines along geographical boundaries, there is a point of subgroup salience, when the team members become aware of the existence of the subgroups.   From this point, Cramton and Hinds (2005) argue the team will generally move towards ethnocentrism, with an in/out group dynamic and the associated negative effect on team performance.   However they argue under certain

conditions the team can move to ethnorelativism, an alternative to ethnocentrism. Ethnorelativism is referred to by Cramton and Hinds (2005) as cross-national learning, which they consider will lead to positive effects on team effectiveness.

Cramton and Hinds (2005) suggest the creation of a 'mutual positive distinctiveness' to facilitate cross-national learning. Mutual positive distinctiveness is the recognising of the positive aspects of both their own group and the other groups. Mutual positive distinctiveness is based on motivation to engage across differences, and information sharing, for which Cramton and Hinds (2005) identify five factors:

- Each subgroup should have equal status

- Structure of the team results in interdependencies across locations

- Institutional and social support for positive interaction across locations

- The team must work towards inclusive communication, not restricting communication to their subgroup

- Teams must pay attention to the sharing of contextual information, i.e. local customs, holidays, work practices etc

Cramton and Hinds (2005) believe that faultlines could lead to more resilient teams and team members when managed correctly.

3.8   Structured management

There is a school of thought that work can be designed for the situation (Kiesler and Cummings, 2002). The structure of the tasks and process can be used to combat errors and help people understand the goals. These practices have been applied to distributed teams through the use of standard procedures and by task decomposition, These have been described as being an substitute for face to face or spontaneous communication, allowing autonomous work and independent decision making. Johnson et al (1998, cited in Kiesler and Cummings, 2002) showed that such methods can reduce role ambiguity and increase local innovativeness.

However structured management can present numerous challenges and problems as well (Kieseler and Cummings, 2002). Examples of problems that have arisen as a

result of the use of standard procedures and task decomposition are:

- difficulty coordinating work and expertise

- trust issues

- failures in information exchange and flow

- a de-personalisation of communication

- innovation as a group hindered

- team members can develop divergent work patterns and habits

- little opportunity to exchange skills or learn from each other

- intensification of differences that existed at the beginning

3.9   Leadership

3.9.1   *Project authority*

A relationship exists between project management structure and project performance (Lecher and Dvir, 2010).   For a high level of project performance, the project manager should have high levels of responsibility and authority; particularly over project team personnel.   Lecher and Dvir suggest the project manager should be sourced from a functional management position, as a result of this high level of responsibility required.

Based on the different levels of responsibility and authority given to the project manager over project aspects, Lechler and Dvir (2010) determined 5 different project management structures.   The use of each is dependent on the structure of the larger organisation, and the specific project requirements.   However one structure was shown to produce consistently poorer performance.   This structure was used where different units were responsible for different areas of the project, and the project

managers' role was to coordinate between the units. This was termed a 'project coordinator' by Lechler and Dvir and was characterised by low levels of project authority and responsibility.

3.9.2   *Leadership in PDTs*

Plotnick et al (2008a,b) describe three different leadership configurations within PDTs.   All are considered to be able to form 'naturally'.   These configurations are defined as:

- Decentralised, each subgroup has one leader, no overall leader.

- Centralised, one overall leader, no subgroup leaders

- Hierarchical, each subgroup has one leader, one leader overall

When able to choose leadership structure most PDTs are comfortable with the decentralised leadership structure (Plotnick et al, 2008b).

Plotnick et al (2008a) note the location of the leaders can affect team interaction and outcome, as leadership location can exaggerate in-group dynamics. Plotnick et al (2008b) note that PDT leadership must overcome in-group effects or conflict could ensure.

Based on a study of leadership and media choices, Plotnick et al (2010) noted that for the centralised leadership structure, a centralised communication platform was commonly adopted.   They posit this was a simple and effective way for the overall leader to communicate with all team members, regardless of location.

Baskerville and Nandhakumar (2007) note a situation where the team leader was located in one town, and gradually team members migrated to this town in part due to the presence of this leader.

4   PROJECT COMMUNICATIONS MANAGEMENT

"Project Communications Management includes the processes required to ensure timely and appropriate generation, collection, distribution, storage, retrieval and ultimate disposition of project information" PMI, 2008, p243.   In this section the theory behind project communications management is reviewed.

4.1   Project communications management processes

The processes identified by PMI (2008) are shown below.
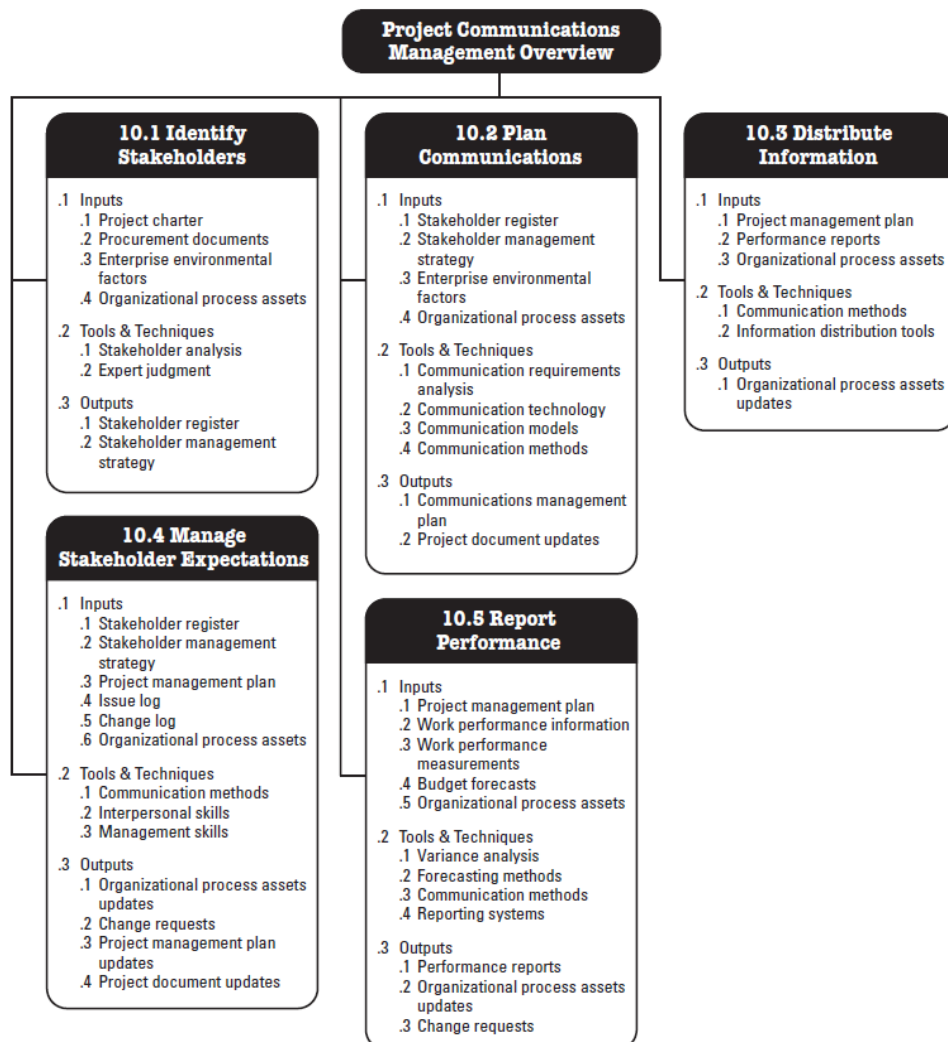
Fig. 2. Project Communication Management Processes from PMI (2008 p 244).

PMI (2008) describes project communication activities as having many potential dimensions such as:

- Internal to the project and external

- Formal and informal

- Vertical and horizontal (within the organisation)

- Official and unofficial

- Written and oral

- Verbal and non-verbal

Dow and Taylor (2008) break project communication into three broad components:

- Communication of the project information (within an appropriate time frame)

- Generation of the right level of information for the customers

- Collection, distribution and storage of the project information.

4.2   Stakeholders

4.2.1   *Identifying stakeholders*

Identifying stakeholders is the first process when preparing a communications management plan (PMI, 2008).   Stakeholders are defined as people and organisations that are involved in or who may be affected by the project and can exert influence over the project.   PMI (2008) note it is critical that stakeholders are identified early in the project, as this allows the development of a suitable strategy for managing each stakeholder.   As the number of stakeholders can be very large, the project manager should focus on managing the stakeholders essential to project success.

As indicated in figure 2, PMI (2008) define a series of inputs, tools and techniques, and outputs from this process.   The outputs from the process, a stakeholder register and a stakeholder management strategy, detail relevant information for all the

stakeholders and ways to maximise support for the project and decrease obstacles for each stakeholder respectively. The material contained in this strategy may be sensitive and not suitable for sharing.

4.2.2   Managing stakeholders

Managing stakeholder expectations during the project can increase the chance of project success (PMI, 2008). They describe this as being achieved through stakeholder understanding of the project benefits and risks, and as a result becoming supporters of the project. Moreover, PMI (2008) note actively managing stakeholder expectations decreases the chance of project failure through unresolved issues involving the stakeholders.

PMI (2008) describe the process of managing stakeholder expectations as "...communicating and working with stakeholders to meet their needs and addressing issues as they occur" p.261. This is achieved utilising the aforementioned stakeholder register and strategy, the project management plan (including communications plan), an issue log and change log, and the organisation process assets.

4.2.3   Communication with external stakeholders

Elsbach (1994, Cited in Gil, 2009 p.2) divides the communication with external stakeholders into two types, acknowledgments and denials. However, generally in project management denials are not an option, and acknowledgments are used to mitigate any perceptions of detrimental project impact on external stakeholders (Gil, 2009). Acknowledgements are seen to be not as defensive, and more concerned with public needs (Marcus and Goodman, 1991, Cited in Gil, 2009).

Based on a study of a large civil project in England, Gil (2009) divides the language used in acknowledgements even further into three groups, assertive, caring and apologetic. Caring language was used when dealing with issues not directly the responsibility of the project, when acknowledging a legitimate issue was still unresolved or when foreseeing a potentially legitimate issue could arise as part of the

project works.   The caring language conveyed a feeling of emotional agreement with the stakeholders concerns.   Assertive language was the most often used, and dealt with issues where the project managers wanted to impress their resolve or commitment to an issue, when an issue was considered exaggerated or when an issue was considered unreasonable.   Apologetic language was used when an error was admitted by the project team.   This was the least used language.

4.3   Communication Management Plan

The purpose of a communication management plan is determining, documenting and planning the information needs of a project, while the goal of the communication management plan is ensuring the correct information reaches the correct people within a suitable time frame (Dow and Taylor, 2008).   They describe the failure to have a communication management plan as "...possibly the biggest mistake a project manager and the team members can make." p.3.

The communication management plan, according to PMI (2008), documents the communication approach for the project manager to communicate with stakeholders effectively and efficiently.   Effective communication is defined as "...the information is provided in the right format, at the right time, and with the right impact.", while efficient communication is defined as "....providing only the information that is needed." p.252.   They note that the communication management plan is prepared early in the project, and reviewed and revised regularly during the project.   This is done to ensure the plan remains applicable.

Dow and Taylor (2008) focus on communication between the project manager and customers, describing how rarely this is planned.   Despite often large amounts of information flowing between the two, neither side sits down and determines what information is required, and the best way to deliver this.   They recommend the communication management plan should be approved by the customer, ensuring their information needs are met, and reviewed regularly to check that the project team is communicating as is set out in the plan.

4.3.1   Communication planning

PMI (2008) define the process of planning communications as "... determining the project stakeholder information needs and defining a communication approach" p.251.   This process can be expressed as a series of questions:

• Who needs what pieces information?

• When they will need the information?

• How will the information be given to them?

• Who will give them the information?

PMI (2008) note that identifying and meeting the information needs of the stakeholders is one of the important factors leading to project success.

Within the communication planning process, PMI (2008) name a series of inputs, tools and techniques and outputs, as indicated in figure 2.   The inputs are associated with stakeholders, factors and assets.   The tools and techniques are for analysing and processing these inputs, with project managers directed to consider communication requirements, communication technology, communication models and communication methods.   PMI (2008) ascribe communication methods into three classes, Interactive Communication, Push and Pull.   Interactive methods describe any methods where back and forth communication is permitted e.g. meetings, telephone etc.   Push methods describe where information is sent out to recipients e.g. letters, email etc.   Pull methods are where the information is stored and accessed as required by recipients e.g. intranet sites etc.

The key output of the communication planning process indicated by PMI (2008) is a communications management plan.   This should be considered part of the project management plan, and should provide details of the information to be distributed including:

• Language, format, content and detail level

• Reason for distribution

- Time frame and frequency

- Who is responsible for distribution

- Who will receive the information

- Which methods and technologies are to be used

Also included in the plan should be:

- Details of who can authorise confidential information

- Time and budget of communication activities

- Process for issues that have not been resolved

- Common terminology to be used

- Charts of information and work flow

- Any constraints on communication

- Details on the reviewing and revising process of the communications management plan

Lastly, the communication management plan can include templates and guidelines.

4.3.2   *Implementation*

The implementation of the communication management plan is described by PMI (2008) as 'Information Distribution'. This process is defined as "...making relevant information available to project stakeholders as planned" p.258.   Also included in Information Distribution is the reacting to unexpected information demands.

PMI (2008) list the outputs from the implemented communication management plan as including but not limited to:

- Stakeholder Notifications

- Project Reports

- Project Presentations

- Project Records

- Feedback from stakeholders

- Lessons learned documentation

4.3.3 *Setting project goals*

Many authors make note of the importance of setting clear goals at the beginning of a project (e.g. Jillins, 2001; Lau, 2004).

Patrashkova-Volzdoska et al (2003) believe that setting clear goals can have an effect on team performance.   Clear goals can minimise the amount of face to face contact and emails required at later stages of the project by team members to understand the goals.   Excess face to face contact and email has been shown to have a negative effect on team performance (Patrashkova-Volzgoska et al, 2003).   Ross (2006, cited in Zhan and Xiong, 2008) notes setting clear goals can boost trust within a virtual team, while Palla et al (2006) believe without clearly defined goals, a virtual team may drift apart, wasting time and resources.

In studies on previous teams, Dyer (1987, cited in Huang et al 1998) determined that effective teams had clear overall goals, while Bradner et al (2005) showed that smaller teams had more clearly defined goals, considered to be a result of the greater ease with which team members of smaller teams can communicate with each other.

4.4 Performance Reporting

Performance Reporting involves the collection and distribution of performance information (PMI, 2008).   Included in this process is the analysis of the collected information against baseline data, and the forecasting of project results.   The form of the performance report may be a simple or elaborate document, and can contain:

- Analysis of past performance

- Current status of risks and issues

- Work completed during the period

- Work to be completed next

- Summary of changes approved in the period

- Any other information which requires revision or discussion

- Some reports will also contain a forecast project completion time and cost

Dow and Taylor (2008) suggest several tools that can be used to report performance. These are described in further detail in section 5.3.

4.5 Relationship with performance

It is often considered there is a direct linear relationship between team communication and team performance, with increased communication leading to improved team performance. Bhusari et al (2007, p.1365) expresses it more bluntly, "You cannot over communicate". However this is in disagreement with Patrashkova-Volzdoska et al (2003), who believe that in fact the relationship is curvilinear. They believe that while insufficient communication results in not enough information being passed between team members, excessive communication and information leads to an increase in information processing, affecting team performance. They therefore believe in an optimal communication level located between an upper and lower threshold.

Based on a study of 80 teams from 25 different organisations, Patrashkova-Volzdoska et al (2003) report email particularly follows this curvilinear relationship. Insufficient or excessive use of email affects all quantified performance aspects (team cohesion, efficiency and goal achievement), while excessive face to face contact impacts on goal achievement. They recommend caution in email use, and ensuring a clear definition of team goals is available.

Suchan and Hayzak (2001) describe a case study of a virtual team where misuse and abuse of a communication tool, voice mail, became an obstacle to efficient team activity. The team created specific 'norms' to counteract this misuse and abuse. Breaking of the norms in the case study resulted in swift rebukes from fellow team members. While the norms didn't detail the situations when voice mail should be used, they did force the team members to be more self conscious, and recognise the

role that communication plays in project efficiency and effectiveness. Communication was recognised as a strategic activity which required conscious thought. The tasks to be completed were related to which media was best suited and a strategy was formulated at the beginning of each workday.

5   COMMUNICATIONS MANAGEMENT TOOLS

Communication management tools allow and assist effective communication. There are numerous tools suggested by authors for use in effective project management; Dow and Taylor (2008) list over 60 tools that can be used throughout a project.   Only a small selection of communication tools have been included in this report; those that are considered to have an impact on communications management in general and combating the negative effects of in-group dynamics in particular.

5.1   Communication Planning

5.1.1   *The communications requirements and role report matrices*

The communications requirements matrix and the role report matrix are two key elements in a communications management plan (Dow and Taylor, 2008).   Together they show the information flow within the project, and answer the key questions posed by PMI (2008); who needs the information, when do they need it, how will they get it, and who will give it to them.

The communications requirement matrix details all the various project roles and key stakeholders, what information each receives, and who generates this information (Dow and Taylor, 2008).   It represents in a single sheet the distribution of information, and can be used by the various project roles to see what information they need to provide to whom, and who is providing them with what information. In addition the 'how' of the information distribution can be included in this document i.e. report, email, meeting etc.

The role report matrix details the various types of reports that will be produced, the names and roles of the people receiving each, and the frequency of each report (Dow and Taylor, 2008).   Whereas the communication requirement matrix details all forms of communication (e.g. verbal etc), the role report matrix focuses solely on formal/issued reports.   This document can be used to see who should receive what report and when, or conversely who should be sending you reports and when.   It is

also useful to determine what reports are available and what information is in each.

5.1.2 *Project kick-off meeting*

The project kick-off meeting is used to initiate the project and engage all the team members to the project (Dow and Taylor, 2008). During this meeting the aims will be to establish a team bond/cohesion and discuss project themes. The meeting will introduce the team members to the scope, goals and objectives of the project. This meeting can be in cooperation with the project owner and project stakeholders, and enable bonds to be formed between these participants also.

Dow and Taylor (2008) indicate the lack of a project kick-off meeting results in a slower start to the project.

5.1.3 *Project calendar*

The project calendar displays important events for the project such as milestones, meetings, activities, deliverables, reports due etc (Dow and Taylor, 2008). It can also display team related personal information such as holidays of team members, or non working periods. The project calendar allows for rapid conveying of key dates, and for assessing the impact any scheduling changes have on the project program. While created during the planning stage, this should be a live document and updated as the project progresses.

5.1.4 *Change control plan*

A change control plan documents the processes to be followed to adopt or reject a change to the project (Dow and Taylor, 2008). It is described as critical to the success of a project, as without this plan the scope can become uncontrollable through a condition known as scope creep, the gradual shifting of the project scope through small changes.

Scope creep is considered a significant risk to the project, and can damage the relationship between the client, the project team and/or any contractors (Dow and Taylor, 2008). The change control plan should be able to identify any impacts the

change will have on the project, especially costs and schedule, and communicate these to the stakeholders.

5.1.5   *Issue management*

The issue management plan contains the process for managing and controlling project issues (Dow and Taylor, 2008).   An issue is defined as an event or situation that requires resolution.   The issue management plan is more than a simple list; it is a structure for how issues are identified and resolved, covering issue management, escalation, resolution and closing.   If an issue plan is not established, then the project team may become quickly overwhelmed, and fail to deal with the issue effectively.

The issue plan should contain a tool for tracking open issues (Dow and Taylor, 2008). This can often be a simple tool that is live and updated regularly e.g. a spreadsheet or word document.   Often several issues may be open at the one time, and a ranking can be applied to ensure priority is focused on the most important.

5.2   Project Executing

5.2.1   *Project database*

Non virtual teams often create a 'war room' where important pieces of information are stored and/or displayed and where progress charts are maintained (Pickering et al 2006).   The virtual equivalent of this is a virtual space or database where information is stored and can be accessed by team members and stakeholders.   In some instances this virtual space can also host discussions through chat or instant messaging functions.

Examples of shared project space can be commonly found in studies and case studies on distributed teams and PDTs (e.g. Pickering et al, 2006; Suchan and Hayzak, 2001; Plotnick et al, 2008 a&b).   Some advantages of such a system are ease of information distribution, ensuring team members have access to the latest revisions of documents, and the creation of a shared language (technical terms etc) (Suchan and Hayzak, 2001).   These virtual spaces can take many different forms such as a

database (Suchan and Hayzak, 2001), a bespoke 3D virtual space (Pickering et al, 2006), or a wiki based system (Plotnick et al, 2008 a&b).

Dow and Taylor (2008) describe the central store of project information as a document control system. This system should be available to users at any time and allow them to access all project information. The project manager can control who has access to the system, for example limiting access to the client. More sophisticated software solutions can send out alerts or emails when documents have been updated or changed, to ensure the information being used is always current.

5.2.2   *Lessons learnt*

Dow and Taylor (2008) describe a lessons learnt document for use in a project team. The stated aim of this document is "...to enable a project team to learn and grow from events in the past" (p463). This document is described as capturing the day to day happenings on the project, with examples given as a lack of communication between team leaders, or customers not signing off on a key document. These details can then be passed to the project team or customer through the weekly status meetings or at an end of project meeting. Dow and Taylor (2008) stress that this document should not be left until the end of the project to complete, but rather the information should be collected continuously during the project.

The lessons learnt document should capture positive information (successes) as well as negative (failures) (Dow and Taylor, 2008). These lessons can be applied to both the current project and future projects. This tool can also be used as a check to see how the process and procedures introduced for the project are functioning, and should prevent the team from making the same mistake. It is recommended that this document be maintained as opposed to a daily log.

In reality the above may be harder to achieve. In many organisations there exists a disparity between what is done for project review and lessons learnt, and what should be done (Williams, 2008). Lack of time and management support are main reasons, while a 'blame culture' can play a large part in inhibiting the lesson learning process. Where project reviews and lesson learning was in place, there still remained issues of

determining the causality of outcomes, and disseminating the information to the organisation as a whole (outside the project team). Williams (2008) notes that using a narrative style i.e. case studies, can be effective in exploring and capturing complex project issues. Disseminating the information is considered to be easier for codifiable knowledge through IT mediated methods, while for tacit knowledge socialisation methods are more successful.

5.2.3 *Project status meeting*

Project status meetings are where the project deliverables, concerns and issues are discussed (Dow and Taylor, 2008). Project status meetings can be divided into two main types: between the project team; and between the project manager and the project customers. Sometimes these can be combined, with the team working through the issues with the client present. This is considered to have the advantage that team members can ask the client directly for clarification or assistance, without having to proceed through formal channels.

For the project manager the project status meeting represents a chance for the project team to meet and interact with each other, sometimes this may be the only time the team comes together as a whole (Dow and Taylor, 2008). The meeting frequency is commonly weekly, although bi-weekly and daily meetings are also commonly held. If the project is entering a particularly important stage, or numerous problems are being encountered, increasing the frequency of the meetings until the stage is over or the problems are resolved is often undertaken. A meeting frequency of greater than a week is not recommended, as it is easy to lose control of a project (Dow and Taylor, 2008). The information flow in a project meeting can be two way, allowing team members to find out the overall progress of the project and other areas which are causing problems.

Project status meetings are described as critical to the success of a project due the large amount of communication that can be achieved within one. They can fall into several categories, for example, budget, or one particular aspect of a project. The status meetings produce minutes for distribution.

5.2.4   Work break down structure and work package

The work breakdown structure defines all the tasks on a project (Dow and Taylor, 2008).   It is a project scheduling and project scope management tool, literally breaking down the project goals into phases, levels and ultimately tasks.   It helps identify project deliverables, enables cost and duration estimation, and can also ensure that all work is considered and included in project planning.

Dow and Taylor (2008) describe the work package as the lowest level of a work breakdown structure.   Each work package is an individual task, with a specific deliverable associated with it.   Each package should detail the task, the resources available for the completion of the task, the estimated duration of the task, an estimated cost for the task and a method of reporting task progress.   The work packages should include a form to be signed off as they are completed.

A work package allows the project manager to easily track progress, estimate duration and costs more accurately, facilitate easier reporting and help control against scope creep (Dow and Taylor, 2008).   The completed work package forms can be used as documented proof of completion of a task.

5.3   Reporting

5.3.1   Daily project report

Dow and Taylor (2008) describe this report as the documented outcome of a daily progress meeting.   They recommend a 30 minute meeting is held at the beginning of each working day to discuss the project and progress.   The meeting is based on three questions asked by the project manager to each team member: what did you do yesterday; what will you do today; what is stopping you from doing your work. The meeting format is short and simple, and the daily progress report is prepared containing the answers to each question and distributed immediately after.   This differs from a periodic report, as the reference time span is small and the information is up to date.

Some advantages of a Daily Project Report as given by Dow and Taylor (2008) are:

providing real time progress information to the client (and possibly upper management); informing the same about what is stopping progress (obstacles), with the opportunity they are able to provide assistance; and increasing the accountability of each team member, as a daily report requirement allows the project manager to monitor team member activities on a daily basis. In addition the daily reports can be easily referenced and compiled to form weekly and other periodic reports.

5.3.2   Periodic reports

These reports are used to provide project information on a regular basis to stakeholders, generally weekly (Dow and Taylor 2008). The project status report and project newsletter are both types of periodic report. Other examples include budget reports, staffing reports, issue reports etc.

5.3.3   Project status report

The project status report is a periodic formal method of communicating project information to key stakeholders (Dow and Taylor, 2008). Often it is distributed weekly at the end of the day on Friday, marking a point where each new reporting period begins. This report is the official record of progress, and should contain the latest status of all areas of the project, along with any issues that have arisen or any major changes to the project. The style of the report is often high level, without extensive detail. The project status report will have two main audiences, project team members and clients.

5.3.4   Project newsletter

Dow and Taylor (2008) describe the idea of a project newsletter as presenting project information in an informal and 'fun' manner. This includes greater use of colours, a more light hearted tone of language and fun graphics. Project newsletters should be sent to all involved in the project (stakeholders) and often those not involved e.g. used as marketing or passed onto to other departments.

According to Dow and Taylor (2008), project newsletters should contain 'high-level' project information (similar to the project status report), along with current

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information, time lines, help wanted, contact information and a biographical write up on a team member.   Use of a newsletter can assist in gaining support for the project, or possible intervention when necessary.

6 REMOTE CONSTRUCTION AND MINING PROJECTS

Unlike IT or product development projects, construction and mining projects are based around fixed specific location(s). This can drive the use of distributed teams and PDTs, depending on the relation of the location of the project site to the company's usual places of work. In this section some of the issues associated with remote mining and construction projects are briefly reviewed.

6.1 Remote Construction Projects

6.1.1 *Benefits and reasons for use*

A desire for company growth may prompt an engineering company to bid for projects outside its geographical area (Lau 2004). Rather than establish local temporary offices, a distributed team structure is used to deliver the project.

Alternatively the company may have opted to create 'centres of excellence' within the company; locating skill sets together (Lau, 2004). To then deliver a project using these centres of excellence, but without large amounts of travelling, a distributed project structure would be used.

Lau (2004) described several advantages for using a distributed team structure.

- The company can react quickly to market changes

- Reduced travelling and commuting time

- The company can accommodate workers desire for different locations and working hours

- The company can provide employees with the right qualification, regardless of location

6.1.2   *Example project team structure*

Lau (2004) describes a road construction project in Singapore; the project manager and several engineers were based locally, with the bulk of the remainder of the design team located in Sydney.   Several specialists were located in Melbourne and Hong Kong.   The team members were all from the same company, worked on the same project, yet all communication was through ICT.

Kajewski et al (2003), describe the organisation structure of a remote construction project in Queensland Australia, with local staff and a representative from the client, contractor and the project manager located at the site; while the project manager, client and head contractor were all located remote.

6.2   Remote Mining Projects

6.2.1   *Use and benefits*

Mining construction projects are subject to location constraints that are quite unique. Unlike other industries where a choice of location may be available, mining projects usually must be located within the vicinity of the ore body to be exploited.   Thus following the trend of ore body exploitation in increasingly remote locations, mining construction projects are increasingly occurring in more remote locations.

The current tendency is to establish mine sites in remote location as non residential sites, i.e. the workforce is housed in simple 'camp' accommodation, and workforce levels are based on a commuting roster.   This is mostly due to the effectiveness of modern communications and fast commuter aircraft (McCarthy, undated).   In addition there is a trend for personnel to reject work in the countryside and remote locations in favour of cities (McCarthy, undated).   The end result of this is transference of jobs from a mine site location to a city based location.

McCarthy (undated) lists the following advantages for transferring non-operating positions to a city location:

- Reduction in travel, accommodation and other onsite costs

- Improved work productivity and quality when located away from mine interruptions

- Engineers are exposed to a wider range of technical peers and senior staff

- Easier to attract and retain experienced personnel for a centrally located position

- Work continuity is better, as the staff are only absent two days (over the weekend) than for a week or weeks at a time found in a mine commuting roster

- Dedicated thinking and planning time is available

6.2.2 *Non-business communication*

Employee morale can be a concern in remote mining projects. Walker (2010) describes an example of a mining company that provided dedicated communication facilities to the employee housing compounds at their mines, separate from the main corporate system. "As mining projects spring up in increasingly remote areas of the world, feelings of isolation can become quite common throughout an onsite workforce. One key to retaining employees facing long periods of separation is to provide convenient communications to the outside world." Walker (2010).

7 DISCUSSION

"Effective communication within the project team and between the project manager, team members, and all stakeholders is essential" (PMI, 2008, p.419).   For a remote mining project, where the project team is split into site and office based subgroups, this communication is made more difficult by the discontinuities that are associated with this type of team structure.   This adds all the challenges faced by PDTs to the original challenges faced by any project team.

One key problem facing remote mining based PDTs is the formation of in-group dynamics.   As noted by Plotnick et al, PDTs are susceptible to in-group dynamics. As Polzer et al (2003) determined, distance by itself can form a faultline, when all other demographic factors are the same or similar.   Along with the very obvious boundaries, for the site based team there is anticipated to be a large amount of close contact time, in a sometimes hostile environment.   This can lead to the reinforcing of the faultlines.

However as Cramton and Hinds (2005) note, while there is little that can be done to prevent the subgroups from becoming salient, there is a lot that can be done to prevent the negative effects of in-group dynamics.   If the subgroups can be directed to a level of shared understanding and culture, a stronger team can result, preventing the negative effects of in-group dynamics.

In this section I will look at aspects of project communication management, primarily the communication management plan, communication structure and communication tools, with a view to create effective PDTs and prevent the negative effects of in-group dynamics.

7.1 Communication Planning

The communication planning process is one of the first steps in a project.   However, as communication has been highlighted as a key factor in the success of a project (Dow and Taylor, 2008), it is a very important step.   PDTs face numerous

challenges, and adequately addressing these challenges at the planning stage could determine the project success.

7.1.1 *In-group dynamics*

Conflict, misunderstanding and ineffective communication arising from in-group dynamics has been highlighted by numerous authors as a key problem in PDTs. As Polzer et al (2003) note "Paradoxically, team members efforts to collaborate are thwarted by the very differences that were supposed to be the source of their success" (p.3). As a result, aspects that can affect the development of faultlines, the activation of faultlines, and the negative effects of in-group dynamics are considered key elements of communication planning.

Cramton and Hinds (2005) provided a series of guidelines to combat the negative effects of in-group dynamics. To effectively utilise these guidelines, they should be considered during the earliest stages of the project, and actively integrated into the communication planning process as much as possible.

7.1.2 *Communication Plan*

The formation of the communication management plan should be undertaken during the planning stage of a project (PMI, 2008). PMI describe the communication management plan as detailing the communication approach between the project manager and the project stakeholders. While it is noted that members of the project team are also considered stakeholders, PMI (2008) makes no specific reference to communication management within the project team.

Dow and Taylor (2008) describe the communication management plan as primarily developed between the project manager and the customers. They place significant focus is placed on this area, noting how often this area is overlooked. Less emphasis is placed on communication with the upper management, stakeholders and project team respectively.

The lack of consideration to intra-team communication in project management literature is considered an oversight. Face to face communication is considered to

be the best form of information exchange (e.g. Daft and Lengel, 1986), and when there is ample opportunity for this, intra-team communication is perhaps not as important an issue as other forms of project communication. However while traditional collocated team configurations can still be found, the degree of 'virtualility' of teams appears to be increasing. A study of the Intel organisation found that 2/3^{rds} of the employees worked in a virtual manner (Pickering et al, 2006).

In a PDT situation, the challenges posed by discontinuities, lack of mutual knowledge, lack of proximity, lack of face to face contact, temporal and geographical distance and in-group dynamics, pose significant project risks. These challenges need to be considered, the risks assessed, and ways of reducing these risks planned. The inclusion of intra-team communication within the communications management plan is therefore considered essential within a PDT project. As Cramton (2002) states, "Designers of dispersed teams should aggressively explore in advance potential difference in team members local situations that could affect collaboration" p.364.

7.1.3   *Excessive communication*

As indicated by Patrashkova-Volzdoska et al (2003), excessive communication can be a barrier to successful projects. Email was highlighted as being a particular communication media that was used excessively.

Within a remote mining situation, media choices may be limited, leading to greater reliance on robust methods such as email. Depending on the time difference, the exchange of emails would then be synchronous or asynchronous.

If the time difference allows synchronous exchange of emails then excess email as found in many project situations could result (Dow and Taylor, 2008).   In the case of partial or complete asynchronous exchange of emails, a situation may result where a significant portion of time is spent at the beginning of each working day dealing with the emails that arrived during the non working hours. This is similar to a situation Suchan and Hayzak (2001) describe in a case study of a virtual team regarding the use of voice mail, where a team member described waking up to 63

unheard voice mail messages.

To counteract this, guidelines on the use of email should be established and included in the communications plan. These guidelines do not need to dictate the situations when email can and cannot be used, rather they should encourage the sender to consider the strategic and efficient use of the tool. In the case study of Suchan and Hayzak (2001), the team created norms to control the use of voice mail. "These norms forced CST members to be more self-conscious about oral communication and to recognize that project efficiency was directly linked with strategic, careful use of communication media" p181.

It was noted by Cramton (2002) that the need to promote inclusive communication can conflict with a desire not to overload the team with emails. A balancing act is therefore required, ensuring everyone is kept up to date, while at the same time ensuring that irrelevant and pointless emails are not sent to everyone in the team, reducing their efficiency. Cramton (2002) recommended some simple guidelines e.g. highlighting the important points of an email, or ensuring any questions that are asked are immediately apparent.

One tactic that could be adopted is the judicious use of the issue management plan and project database (see section 7.2.4 for further discussion on the project database). Rather than having to explain issues through lengthy emails, the emails could instead refer to open issues within the issue tracking tool available in the project database. To ensure all information is included in one place, the issue management plan may need to specify an area where discussion of an issue can be taken. This would be opposed to the lengthy email 'conversations' that can often develop.

7.1.4   *Initial meeting*

Holding an initial face to face meeting or 'kickstart' meeting is a common feature in successful virtual teams (Dow and Taylor, 2008; Gluesing et al, 2003 and Hertel et al, 2005, both cited in Baskerville and Nandhakumar, 2007 p.18). The duration of these meetings can vary, with some lasting up to several days. Suchan and Hayzak (2001) describe the use of a 3 day workshop with team building exercises as an example of a successful initial meeting. There are many reasons for and advantages

to such a meeting.   This meeting can:

- Introduce the project to the team and stakeholders

- Build trust and team cohesion

- Develop aspects of the communication management plan

- Discuss and clarify project goals

- Assist against in-group dynamics

The use of the initial team meeting was described by Dow and Taylor (2008) as a place to present the project scope, goals and objectives.   They describe this meeting occurring between all key stakeholders i.e. team members, project owner/sponsor, contractors and any other (important) interest groups.   This meeting allows each stakeholder to understand their role in the overall project.   While it may be beneficial to bring all these together for an initial meeting if practical, it is considered this should only be a portion of any initial meeting, or at a separate occasion.   The inclusion of non-team members for any discussion on project goals and communication guidelines is not considered beneficial.

Baskerville and Nandhakumar (2007) describe personal trust as an antecedent to effective working in long term virtual teams.   Personal trust is best created or maintained through periods of collocation, or face to face contact.   Thus to develop the required trust in a PDT initial face to face contact is considered necessary. Sufficient time should be given at any such meeting for the team members to socialise and interact.

The dialogue framework proposed by Huang et al (1998) has been shown to improve virtual team development and performance (Tan et al, 2000; Huang and Lai, 2001; Guo et al, 2010).   This framework is based upon a meeting (either face to face or using ICT) at the team development stage.   A key outcome of the dialogue-based framework is a model of communication practices to be adopted by the team. Although as noted previously, the use of the dialogue technique versus a simple

discussion of communication practices has not been proved exhaustively.

Utilising the framework established by Huang et al (1998), communication practices could be developed which could then be placed directly into the intra-team communication section of the communication management plan. Alternatively a discussion on the communication guidelines to be adopted during the project could be undertaken, without utilisation of the dialogue technique. Any discussion on communication guidelines should include media choice, as each subgroup may have different favoured media (Plotnick et al, 2010).

It may also be necessary to include guidelines for the use of the media for non-business purposes i.e. personal communication between family and friends. As Walker (2010) describes, worker morale can be affected to communication with family and friends. If a dedicated system is not available, the use of the corporate system could cause conflicts or complications if guidelines are not established.

The importance of setting clear common project goals can be emphasised in a PDT. Unclear project goals has been linked to excessive communication, wasted resources and lower team performance (Patrashkova-Volzgoska et al, 2003; Palla et al 2006). Although the setting/creation of the project goals is a management activity, it is inevitable there will be some discussion amongst the team on the exact interpretation. To limit resources wastage at later stages of the project, and possibly when in-group dynamics may be stronger due to faultline activation and sub group awareness, a period of discussion on the project goals during an initial meeting could be encouraged. Similar to the advantages given for establishing communication guidelines, agreeing project goals at the beginning of a project could see the team members 'buy in' to the goals earlier, and avoid any misunderstanding, confusion and wasted resources later.

As Cramton (2002) recommends, a good way for the team to gather situational information about each other is to hold the meeting at one of the subgroup locations, rather than a neutral or midway location. This allows greater understanding of the local situation, and can provide further contextual information that may not have been noted if each subgroup was simply asked to list important contextual

information.   Understanding of the contextual situation of each subgroup is one of the guidelines proposed by Cramton and Hinds (2005), and can aid in the establishment of mutual understanding.   It should be noted, depending on the progress of the project, the site may simply be an empty plot of land, with limited contextual information to be gained.   Holding this initial meeting at the design office then may provide more benefit for the team as a whole.

7.1.5   *Communications structure*

The choice of communication structure from solely an in-group dynamics viewpoint would be one that is highly inclusive, i.e. the low impact or high network. Achieving this however may be more difficult than simply stating that is how the communication should function.   Factors such as leadership, personal preferences, technological reliability etc will all affect the eventual structure adopted.   If the team prefers to interact within subgroups as opposed to across subgroups, this may not be easily changed.

The creation of interdependencies is recommended by Cramton and Hinds (2005), requiring team members to interact across subgroup boundaries.   Tasks should be linked across the boundaries.   Leadership, both style and structure, could play an important role here.   Institutional and social support for cross subgroup interaction is also required (Cramton and Hinds, 2005).   There are many ways subgroup leaders could fail to support inter-subgroup communication, e.g. through demanding that all information pass through them first, or not encouraging interdependencies.

Kiesler and Cummings (2002) discuss the use of structured management to increase distributed team effectiveness.   Structured management is designing the work to increase team effectiveness and circumvent problems.   In distributed teams this has been primarily achieved through the use of task decomposition and standard procedures.   While the use of structured management resulted in mixed successes, the intention behind this form of structured management (standard procedures and task decomposition) was to reduce the dependence on communication between team members, allowing team members to work autonomously.   In other words, effectively isolating the team members or subgroups.

Task decomposition is similar to the work breakdown structure and work packages discussed by Taylor and Dow (2008). In both, the project goals are broken through various levels to singular tasks with a single deliverable. These tools were described as helping with the scope and scheduling of the project, task and deliverables identification and cost and duration estimating. Dow and Taylor described the work breakdown structure as "....the skeleton and foundation for every project...." (p.153).

Combining elements of the above, the design of the work breakdown structure and work packages could be fashioned to increase the interdependencies across potential subgroups, and in such a way as to promote the desired communication structure. Any such interdependency structure will also require the support of the team management, regardless of leadership structure. It is hoped with the institutional support, the social support should be forthcoming.

Care must be taken though, to avoid assigning work autonomously, similar to structured management, as this may produce results directly against what is desired i.e. decreased intra-team communication and cohesion. Other disadvantages discussed by Kielser and Cummings were problems co-ordinating work, with the possibility of an extra level of clerical staff developing, adding extra layers between the team members.

7.2   Project Execution

7.2.1   *In-group dynamics*

It is during the project execution stage that the negative effects of in-group dynamics can affect the project performance. During this stage the majority of faultlines will develop, the teams will become salient of the faultlines, and behaviours may change. Reductions in team cohesion, collaboration, communication and an increase in conflict could be apparent. Any methods designed to combat the negative impacts of in-group dynamics that were discussed/implemented in the planning stage will now require monitoring and or modification.

The distance, both temporal and geographical will be one of the most obvious faultlines. Another faultline that could reinforce distance is the designer/executor or theorectical/practical divide, as it is anticipated the design portion of the team will be located at the main office(s) while the portion of the team responsible for implementing the design will be located at the site. Other reinforcing factors could be the harsh conditions and longer working hours experienced by the site subgroup, along with difficulties with contractors and subcontractors. Cultural difficulties may also develop into a faultline, depending upon the makeup of the team and from where the team members are originally sourced.

Another potential problem is the large amount of face to face contact that both the collocated subgroups spent together. Within most of the studies on PDTs, (primarily Plotnick et all) the subgroups had the option of meeting together. In a formal working environment, the subgroup members will most likely spend a far greater amount of time together, even if not working on the same project. This close proximity will most likely strengthen group identity as discussed by Kiesler and Cummings (2003). As a result the effects of in-group dynamics might be more apparent than noted in student teams who only met sporadically.

7.2.2   *Leadership*

Plotnick et al note (2008b) that a decentralised leadership structure was the most natural for PDTs. However this was based on a study of students who were allowed to choose the leadership structure. Within a project team it is considered less likely team members would be allowed to choose the leadership structure.

Comparing the decentralised leadership structure to Cramton and Hinds guidelines, this appears to satisfy one guideline, namely that each subgroup has equal status.

Having one overall leader (centralised or hierarchical) requires this leader to be located at one of the subgroups. This would then favour one subgroup over the other. In the case study noted by Baskerville and Nandhakumar (2007), this could lead to a gradual migration towards this location, as this subgroup is considered more important, where all the decisions are made.

Within the study performed by Ocker et al (2010), all teams were requested to use a decentralised leadership structure. From this, the communication structure was primarily hub and spoke or moderate network. The few teams that used a high network structure reported a high degree of inclusiveness, compared with the other two structures that reported less inclusiveness. It appears as though the decentralised leadership structure does not lead to significant cross subgroup communication. The subgroup team leaders act as "gatekeepers", controlling all information.

Team leadership and communication structure require careful management. The most natural leadership structure of a PDT is a decentralised structure, where each subgroup has a leader, with no overall leader (Plotnick et al, 2008b). This fits well with Cramton and Hinds (2005) recommendation for subgroups to have equal importance. However Plotnick et als study was based on students who were able to choose a leadership structure. This is considered unlikely in a commercial project team as team members will have predefined organisational roles with levels of real or implied seniority. In fact it is noted studies utilising students ignore the differing levels of power present in a commercial organisation (Panteli and Davison, 2005).

In addition the most common communication structures adopted when the leadership structure is decentralised (hub and spoke and moderate network), were the ones that did not facilitate the most communication inclusiveness (Ocker et al, 2010). The communication structures that facilitated the most communication inclusiveness were the high network (as defined by Ocker et al), or the low impact, (as defined by Panteli and Davison), yet these were the least common in their respective studies.

Adopting a Centralised or Hierarchical leadership structure, appears to fit better with commercial project teams. However the location of the overall leader would then favour one subgroup over the other(s), with the potential for the creation of a power faultline. Also this would be against Cramton and Hinds recommendation, and could lead to a situation described by Baskerville and Nandhakumar (2007) where the team members gradually migrated to where the overall team leader was located.

Attempting to alleviate this situation, by creating a coordination role, with no great power would then be expected to adversely affect team performance based on Lechler and Dvir's (2010) study. Thus if a centralised or hierarchical structure was adopted, care must be taken to ensure that the overall leader has sufficient authority and responsibility. A failure to provide sufficient authority and responsibility, particularly over personnel could potentially have a double negative effect, hindering performance while creating power faultlines.

There appears to be no simple solution to team leadership and communication structure. The desire to assign teams equal status and to promote inclusive communications, although not appearing to be contradictory, in reality may be quite difficult to achieve.

7.2.3 *Communication tools*

Effective communication is important for project success (PMI, 2008), while inclusive communication is important to prevent the negative effects of in-group dynamics (Cramton, and Hinds, 2005). As a result the use of communication tools to provide both effective and inclusive communications is important in any project. There are many communication tools available to the project manager; Dow and Taylor (2008) list over 60 tools that can be used throughout a project. Only a small selection of the available communication tools have been considered in this report; those that have an impact on communications management in general and combating in-group dynamics in particular.

As the selection of communications tools discussed here is in no way complete, with numerous other options available for the project manager and team to adopt, it is considered additional project communication tools will be needed for adequate project functioning. However it can be stressed that any tool which contradicts the guidelines by Cramton and Hinds (2005) for example, promotes selective communication, or encourages autonomy, is used with caution.

7.2.4   *Project database*

As noted by Pickering et al, the use of a shared space or 'war room' where important information is displayed and stored is a common feature of a collocated project team. When this team is partially distributed, a single physical location is not possible for such a war room.   While the creation of a physical war room for each subgroup is possible, great care would need to be taken to ensure the information presented in each is the same.   For example, Suchan and Hayzak (2001) describe a situation in where due to poor management of information, virtual team members were less informed than the client(s) and different team members provided contradictory information to a client.

To combat this poor information management, the virtual team in Suchan and Hayzaks (2001) study developed several project databases accessible by all team members where the project information was stored.   This enabled consistency in information between virtual team members, prevented rework, and helped developed a common language between the team members.

Pickering et al (2006) described a similar solution using higher level technology, a virtual shared project space where all project documents in progress etc are stored. Team members have access to the latest information and can see any changes.   Also within this shared space is a 'memory' function, allowing team members to backtrack and see the process leading up to a decision.   A lower tech solution adopted by computer literate students, was the wiki based website.

The advantages of a shared database/virtual space for the project can assist in information management within a PDT.   Benefits include a shared language and less rework.   This communication tool can be included in the intra-team section of the communications management plan.   Document storage and control can and should be integrated into the project database system.

The flow of information can form a faultline (Huang and Ocker, 2006), for example where one subgroup is in regular contact with the customer, and is in control of the flow of this information to the remainder of the team.   The creation of a shared

virtual space containing all the latest project information, requirements, progress etc, could be used to promote inclusive communication. Plotnick et al (2010) noted in their study on leadership and media choice that a centralised leadership structure often adopted a centralised communication platform, as this was " ...the easiest way for the team leader to reach all the remote members..." (p.7). All team members would have access to the same information at the same time (time differences notwithstanding). Also the use of a shared space would promote a common language for technical terms (Suchan and Hayzak, 2001), avoiding communication misunderstandings and potentially aiding shared team identity.

Some of the communication tools recommended by Dow and Taylor (2008) could be included in the project database to ensure they are available to all team members at all times. For example important planning documents like the communication requirements matrix and the roles and responsibilities matrix should be included. Additional tools that should be available to all team members and should be included are the issue management plan, change control plan and project calendar.

7.2.5   *Lessons learnt*

Both Dow and Taylor (2008) and Williams (2008) stress the importance of learning from a project. This learning can be applied to future projects and to the management of the current one. However while Dow and Taylor describe this as a simple process and tool, Williams believes it is a more complex process.

The process that Dow and Taylor recommend is based on two questions, 'what went wrong?' and 'what went right?'. They do acknowledge that eliciting the lessons learnt from team members can be difficult, and that simply asking 'what lessons have we learnt?' rarely results in the correct information. Dow and Taylor also note that a lessons learnt document updated daily, is better than a daily log.

Williams focuses more on organisation wide lessons learnt collection and dissemination, and notes that this appears to be more successful when institutionalised i.e. a separate department solely for this function. In addition Williams notes more success can be had with a narrative style of recording. This is

believed to be because the project situations are often very complex. While portions of any lesson learned study can be codified, it is noted that the tacit knowledge is also important and requires transference. This is best achieved in a more social setting.

Examining these in the context of a construction or mining PDT, we can see the need once again for face to face contact. The use of a daily lessons learnt document as opposed to a daily log, while recommended by Dow and Taylor may not achieve much, particularly when the team is split and separate records will be made. It appears hard to see how the role the other subgroup played will not always be presented worse, based on in-group dynamics. Attempting to reconcile the two documents could lead to assigning blame and arguments.

Instead the narrative technique applied with all parties contributing may be a better solution. As noted by Williams, the transference of the tacit knowledge requires social interaction, so incorporating a lessons learnt exercise into the regular face to face meeting could be beneficial. The issues could be sourced from a daily log or daily lessons learnt document, and the causality discussed in such a meeting and recorded.

7.2.6   *Project status meeting*

A project status meeting is described by Dow and Taylor (2008), as one of the few chances for a project manager to collect all his team together. This is considered by Dow and Taylor one of the key advantages of such a meeting. Significant project issues can be discussed with all team members present, and sometimes also with the client present, allowing resolutions to be decided upon with minimal further consideration from other parties required. However the frequency of this meeting is recommended by Dow and Taylor as weekly and longer periods between meetings are said to lose control of the project.

Meeting face to face weekly is not considered an option for a PDT due to the intensive travel time involved and the prohibitive cost. Holding subgroup project status meetings weekly is therefore an alternative option, although without full

participation of the team, resolution of issues may be difficult. If this was considered, care must be taken that the outcomes of any meeting are adequately communicated to the rest of the team. Gathering the whole team together is discussed further in section 7.2.7 below, however the frequency of any whole team meeting is anticipated to be anywhere from 3 to 6 months or longer.

If shorter frequency meetings are desired or considered necessary, the use of ICT to facilitate a meeting is a possibility. As discussed further in section 7.2.8, this would be dependent on time differences and the necessary ICT infrastructure being available.

7.2.7   *Periodic face to face meeting*

Similar to the initial meeting, the need for regular face to face contact within a project team can be argued on many fronts. Such a meeting can be used to:

- Discuss and resolve (sensitive) project issues and resolve conflict

- Develop and maintain personal trust

- Review the project communications plan

- Facilitate lessons learnt

- Promote greater group identity and prevent in-group dynamics

As discussed in section 7.2.6 above, a meeting of the whole team is an excellent place to discuss project issues. Conducting this meeting face to face, in the richest of all media is an opportunities for discussion of sensitive issues, or for resolving any areas of conflict. Face to face contact should minimise misunderstandings that can arise with ICT use.

Baskerville and Nandhakumar (2007) consider personal trust will decline over time. Depending upon the length of the project swift trust, abstract trust and pre-established personal trust may be sufficient to sustain the trust for the duration of the project, and the decline in personal trust may not greatly affect the project outcome.

However for longer duration projects the renewal of personal trust through periodic face to face contact will most likely be necessary. It is noted a chance to socialise is considered important, and allowing a time either before or after the meeting for the team to socialise e.g. a meal before or after is recommended.

As recommended by both PMI and Dow and Taylor, the project communications plan should be considered a live document, and reviewed periodically. A meeting with all project team members present would be an ideal opportunity for this. The success of the communications approach taken to date can be discussed, and any adjustments as required made to the plan. This is not limited to the communications plan, and other portions of the project management plan can also be discussed.

The most effective way to collect and disseminate lessons learnt is also through face to face contact (Williams, 2008). Any face to face meeting situation is an opportunity to collect and disseminate this knowledge to the project team as a whole. Ensuring the whole project team is present may reduce the 'blame effect' and ensure a more open discussion of the lesson. Also if the whole team is present, the lesson can be absorbed by all team members at the same time.

Similar to the initial meeting, periodic face to face meetings should be held at one of the subgroup locations, as recommended by Cramton (2002). The aim of this is to provide further contextual information about the subgroup based at that location. A rotation policy may suit here, to ensure no location is missed and any discomforts of travel are shared by all team members.

However cost and practicality could play a role here. As the site team is generally likely to be smaller for cost reasons (McCarthy, undated), transporting them back to the design office would be more cost effective. On the other hand during the construction phase of a project, a majority of the issues are likely to be site related. Transporting the site team to the design office is missing an opportunity to expose the design team to the realities of the project site. Seeing project issues firsthand could be invaluable for the design team, allowing a greater understanding of the aspects of the issues. Additionally, it is probably not feasible to transport all site team members, leaving the site unattended, or shut the site for the required duration.

As a result it may be considered more effective to transport the design team or members of the design team out to the project site.

7.2.8 *Media choice*

Within a long term PDT the choice of communication media may play a significant role. Communication effectiveness and trust can be affected by media choice (Plotnick et al, 2010).

Although several theories exist that describe the rationale behind media choice, i.e. richness related to tasks, synchronicity related to processes, etc, the ultimate decision may not be based on a careful choice, but rather 'mindlessness' (Timmerman, 2002; cited in D'Uros and Rains, 2006). Additionally, the available types of media may be limited, particularly in a remote mining situation where high bandwidth may not be readily available.

However regardless of media choice, channel expansion theory suggests that over time it may still be possible to develop effective communication. This is dependent on the experience of the users with the media, each other and the topic; suggesting that teams that have worked together for a long time will communicate more efficiently than new or temporary teams using the same media. This can also be considered an argument for initial and periodic face to face contact, as it is in such a setting with proximity and face to face contact that greater awareness of the other team members can rapidly develop.

Video conferencing is often hailed as next best thing to face to face contact, or sometimes even a replacement for face to face contact. However this type of technology can be affect by unsuitable time differences and technology reliability. In a remote mining situation, it is possible both are unfavourable towards video conferencing, and situations where video conferencing are an option are most likely quite limited.

Telephone conferences are based on more reliable technology, and as suggested by channel expansion theory could go some way towards providing the same richness

and cues.   If the time difference is still unfavourable though, use of telephone conferences may not always be a viable option.

Email can handle both unreliable technology and time differences, and as a result is the workhorse of ICT.   If, as channel expansion theory suggests, email can expand to provide additional richness through experience, then this will most likely be the communication media of choice used for remote project communication.   Care must be taken that email is not over used, as overuse has been linked to team performance. If the project team is new to one and other, there may be difficulties at the beginning before the channel has 'expanded' so to speak.   It may be possible to encourage channel expansion through the use of regular email, if only for trivial purposes at the initial stages.

7.3   Reporting

7.3.1   *Daily report*

The daily report, as described by Dow and Taylor, is a useful tool that aids team member awareness.   Based on a short meeting at the beginning of each working day, key information on each team member's activities and obstacles are gathered.   Each collocated subgroup could prepare their own daily report and forward this to the other subgroups for use at the other subgroups meeting.

The use of the daily meeting and report provides several advantages:

- Informing each team member of the others activities on a daily basis should combat the lack of awareness highlighted by Plotnick et al (2008a).

- Obstacles to team members work are recorded and passed to the other team members and some stakeholders.   This creates the potential for those receiving the report to provide assistance if possible (Dow and Taylor, 2008).   In addition the flow of work is presented clearly to the team.   For example if team member X cannot begin an activity until team member Y has completed their part, this work flow is highlighted as an obstacle.

- The daily report encourages accountability, allowing the project manager to check on team member activity daily (Dow and Taylor, 2008).

- The daily reports can be complied to form weekly or monthly reports (Dow and Taylor, 2008). Within a partially distributed team, this information would be required to be complied and sent from each subgroup regardless, the daily report provides a simple way of achieving this.

7.3.2   *Periodic Reporting*

There are several reporting tools that can be used within a project, not only for project reporting but to aid intra-team communication and understanding. Two examples are the project status report and the project newsletter. Both convey similar project status information, albeit in different ways.

The project status report is described by Dow and Taylor (2008) as a weekly report containing status information, any issues that have arisen, and any major changes to the project. This document could be structured to create interdependencies between subgroups, with each collocated team contributing to a live document that is constantly updated. In addition to ensuring each collocated subgroup actively participates in providing the information, it should be ensured that the information is also read by each subgroup, for example by using it as the basis for status meetings.

The project newsletter is aimed at a wider audience, and includes aspects that are designed to make it more 'fun', for example graphics, colours and team member profiles. Providing team member profiles from each collocated subgroup or rotating through the subgroups could be an additional way of providing contextual information to the other subgroups.

8 SUMMARY AND CONCLUSION

In this section, a summary of the discussion will be presented, along with conclusions, limitations and areas for further research.

8.1 Summary

8.1.1 *Communication planning*

The communications planning process should be as inclusive to all team members as possible, ideally through the use of a face to face meeting, and if possible at the design offices.   If this is not possible at the design offices, the project site should be the alternative venue.   The use of neutral ground should be discouraged.   During this meeting discussion of project goals, and communication guidelines should be undertaken, along with opportunities for the team members to socialise.

The communication plan should include a section detailing the strategy for intra-team communication.   Guidelines for communication use, methods to avoid excessive communication practices, media choice and personal use should be considered and included.   The use of the dialogue technique may aid this process.

During the planning stage of the project, it may be possible to affect the communication structure of the project team through the inclusion of task interdependencies, although care must be taken that autonomous task assigning does not result.

8.1.2 *Project execution*

Continuing face to face meetings during the life of the project should aid team performance.   The frequency of this meeting may vary, however a frequency of 3-6 months is considered reasonable.   During this meeting, project teams should discuss: any current project issues; resolved issues as a lessons learnt exercise; take the chance to revisit the communications plan and make any changes considered necessary; and have time to socialise.   This meeting is considered more beneficial,

if it is undertaken at the project site.

The Project database is an important tool that can be used for various purposes in project communications management. It can ensure that team members are using the correct information, can help develop a common language, prevent rework, and act as a document store and control system. Other communications management tools can be included in the project database, for example the roles and responsibilities matrix and change control plan etc. The effective use of this and other tools can promote inclusive communication, and can be an aid against the negative effects of in-group dynamics.

The leadership structure of the PDT is a difficult issue. No clear conclusion can be reached when all the available literature is considered. Also studies that have been undertaken have focused on student teams that ignore the power/seniority structure that often exists in the commercial world. As a result it may be best to use a structure either that has worked in the past, or is familiar to your team members.

In a remote construction project, media choices may be limited. Simple and robust methods, primarily email and telephone are considered to be the most common means. Based on the channel expansion theory, through user experience these media email may be able to provide effective communication for a PDT.

8.1.3 *Reporting*

The use of several reporting tools, the daily report, project status report and project newsletter, can be adapted to assist in the effective sharing of information and encouraging mutual understanding.

8.2 Conclusion

The use of PDTs can bring advantages to a project, but also many risks. At the extreme end, intra-team conflict could become unmanageable, halting the project. Less extreme, but more realistic, is small episodes of failed communication, lack of collaboration, or conflict eroding away team cohesion, and reducing team performance.

As there is still debate on the effectiveness of PDTs, the decision to use PDTs is often cost and workforce related. This is particularly so in the remote construction and mining industry. However, on the basis of this study, there are methods and tools available that can be adapted to counteract potential problems, and there is evidence to suggest that PDTs can be at least as effective as a traditional team.

As in other areas of project management these tools and methods rely on effective planning at the beginning of the project. The need for effective communication planning and goal setting is supported by all authors. Thus the initial stages of the project can have a big role in the success of the project. As Cramton (2002) notes, once negative feelings for a subgroup or individual develop, they are difficult to remove.

The effective use of a PDT appears to have 'hidden' costs associated with it. As face to face contact is considered by most authors a necessity, significant travel costs could result. Baskerville and Nandhakumar (2007) note that the requirement of distributed teams to use periodic collocated interaction could actually increase the use of global travel, similar to how computers increased the use of paper.

8.2.1   *Limitations*

The ideas presented in the discussion section are based on a review of available literature, and are not based on any trial or study by the author. The tools presented in this paper, particularly those that may assist in reducing the negative effects of in-group dynamics or build trust have not been tested. All potential benefits are theoretical.

A majority of the studies undertaken in the examined literature have been based on student studies. The use of students to represent commercial situations is limited, for example when the students were allowed to choose their own leadership structure. Also it has been noted that students lack the power dynamics present in commercial organisations.

8.2.2 *Opportunities for further study*

Noting the above limitations, there is great potential for further study, primarily examining and documenting in-group dynamic effects in commercial teams. This could take the form of case studies examining and testing Cramton and Hinds guidelines, and testing the tools suggested in this document for their potential to affect team communications.

During the research into mining and construction projects, there appeared to be a dearth of literature in the area of mining and construction management, particularly the 'soft skills' such as communication. A large portion of the papers I located were devoted to technical aspects.

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